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13. ABSTRACT

This report contains the results of an investigation of joint shear strengths using solid rivet fasteners lubricated with lauric acid.

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
YIELD AND ULTIMATE STRENGTH						
FASTENERS						
BEARING STRENGTHS						
LUBRICATION						

DEPARTMENT OF THE NAVY
NAVAL AIR DEVELOPMENT CENTER
WARMINSTER, PA. 18974

AIR VEHICLE TECHNOLOGY DEPARTMENT

REPORT NO. NADC-72055-VT

4 APRIL 1972

EFFECT OF LUBRICATION ON THE JOINT BEARING STRENGTH OF RIVETED LAP JOINTS

FINAL REPORT
AIRTASK NO. A05-530/202-1/2000000000
WORK UNIT NO. 01

This report contains the results of an investigation of joint shear strengths using solid rivet fasteners lubricated with lauric acid.

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EVALUATION AND DISCUSSION

INTRODUCTION

The yield and ultimate shear strength of joints fabricated from various metals using solid rivet fasteners lubricated with lauric acid is reported herein. The results of the investigations showing a reduction of material bearing strength when pins and threaded fasteners were lubricated with lauric acid have been reported in references (a) and (b) respectively.

TEST PROCEDURE

Joint yield and ultimate strengths were determined in accordance with reference (c), using a Tinius Olsen Universal Testing Machine, Model Super "L" UTM Serial 54984-3, and a Baldwin Extensometer, Model TSMD Serial 1029 (Figures 1 and 2). All the rivets and sheet material were initially cleaned ultrasonically in chlorothene V.G.S.A. 1192A. Tests were performed on the clean riveted lap joint specimens, and the yield and ultimate strength was recorded. To determine the effect of lubrication, rivets were then coated with lauric acid ($CH_3(CH_2)_{10}COOH$) and specimens fabricated. The tests were repeated. The test specimens were .063 inches thick, and the rivet holes in the specimens were within a tolerance range of .253 to .257 inches. The installation requirements to form the flat driven heads on the rivets used in the test were in accordance with reference (d).

The four materials used in this investigation included aluminum (2024-T3 Sheet-Heats 1-2), magnesium (AZ31B-H24 Sheet), and steel (PH15-7 Mo Sheet). Rivets of the following types and the driving pressures that were required to form the fastener heads in the lap joints are shown below:

Type	Material	Driving Pressure
MS20470D8-6	Aluminum	12,000 lbs.
MS20470B8-6	Magnesium	9,000 lbs.
NAS1198-8-6	Steel	22,000 lbs.

DISCUSSION

All specimens were subjected to the joint shear test specified in reference (c). One half of the ultrasonically cleaned specimens were tested with rivets that had been lubricated with lauric acid. Careful control of all significant parameters was exercised to determine any effect upon the lap joints' bearing yield and bearing ultimate strength produced by lubrication of the rivets.

Joint yield strength was determined from load deflection curves using the second modulus method for hole filling fasteners in accordance with reference (c). The bearing yield loads are shown on the load deflection charts, Figures 3 through 82. The joint bearing yield and bearing ultimate strength was calculated by dividing the applicable load carried by the bearing area. The results obtained are shown in Tables I through VIII. The average strength of the lap joint specimens tested with lubricated rivets was consistently lower than those of the specimens tested with non-lubricated rivets, Table IX.

CONCLUSIONS

It is concluded that joints fabricated with lubricated rivets, like those fabricated with lubricated threaded fasteners, have lower bearing yield and bearing ultimate joint strengths than when fabricated with clean fasteners.

RECOMMENDATIONS

It is recommended that this effect be considered in the preparation of MIL-HDBK-5 since the reductions are not the same for hole filling fasteners (rivets), non-hole filling fasteners (bolts), and sheet materials.

REFERENCES

(a) NAVAIRDEVCEN Report No. NADC-MA-7007 of 31 Dec 1970, Effect of Lubrication on the Bearing Strength of Various Metallic Materials

(b) NAVAIRDEVCEN Report No. NADC-MA-7162 of 27 Sep 1971, Effect of Lubrication on the Joint Bearing Strength of Metal Joints

(c) MIL-STD-1312 Notice 1 - Test 4, Joint Shear Strength

(d) NAVAIR 01-1A-8 Technical Manual Structural Hardware

ALUMINUM
2024-T3
HEAT-1
(ALCOA)

NOT LUBRICATED			LUBRICATED		
SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)	SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)
1-A	101,269	138,095	4-AW	93,650	106,031
2-A	101,587	135,238	3-AW	91,746	111,111
3-A	101,587	136,507	5-AW	91,746	114,920
5-A	101,904	136,825	2-AW	92,063	116,825
7-A	98,412	136,825	6-AW	90,793	118,095
AVG.	100,951	136,698		91,999	113,346

NOTE:

8.8% decrease in bearing yield strength when lubricated.

17.0% decrease in bearing ultimate strength when lubricated.

TABLE I

ALUMINUM
2024-T3
HEAT-2
(HARVEY)

NOT LUBRICATED			LUBRICATED		
SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)	SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)
2-H	103,174	136,507	12-HW	90,476	111,746
3-H	107,396	137,142	14-HW	89,841	113,333
4-H	108,888	137,777	18-HW	90,158	115,555
7-H	106,349	139,047	11-HW	87,619	117,460
1-H	99,682	145,396	16-HW	93,333	119,682
AVG.	105,097	139,173		90,285	115,555

NOTE:

14.0% decrease in bearing yield strength when lubricated.

16.9% decrease in bearing ultimate strength when lubricated.

TABLE II

MAGNESIUM
H-5070
(DOW)

NOT LUBRICATED			LUBRICATED		
SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)	SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)
3-D	66,349	86,349	15-DL	60,317	83,809
1-D	71,428	88,571	18-DL	63,492	83,492
6-D	72,06[illegible]	88,888	17-DL	60,372	84,444
7-D	65,714	89,523	10-DL	66,031	87,301
11-D	65,079	90,476	16-DL	61,904	86,031
AVG.	68,126	88,761		62,423	85,015

NOTE:

8.3% decrease in bearing yield strength when lubricated.

4.2% decrease in bearing ultimate strength when lubricated.

TABLE III

MAGNESIUM
7546
AZ31B

NOT LUBRICATED			LUBRICATED		
SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)	SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)
2-M	67,619	82,539	4-ML	58,412	79,047
5-M	68,571	85,079	1-ML	58,095	81,904
3-M	68,253	85,714	8-ML	57,142	81,904
4-M	68,888	86,984	6-ML	60,317	81,904
10-M	69,841	88,253	5-ML	59,365	82,539
AVG.	68,634	85,713		58,666	81,459

NOTE:

14.5% decrease in bearing yield strength when lubricated.

4.9% decrease in bearing ultimate strength when lubricated.

TABLE IV

MAGNESIUM
C-70065
(DOW)

NOT LUBRICATED			LUBRICATED		
SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)	SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)
D-2	60,317	82,222	13-DL	55,555	77,142
D-1	60,317	82,857	16-DL	55,873	78,412
D-5	60,634	83,492	10-DL	55,873	78,730
D-7	63,492	84,126	12-DL	57,142	79,882
D-8	60,634	85,398	11-DL	56,825	80,000
AVG.	61,078	83,619		56,253	78,833

NOTE:

7.8% decrease in bearing yield strength when lubricated.

5.7% decrease in bearing ultimate strength when lubricated.

TABLE V

STEEL
870255

NOT LUBRICATED			LUBRICATED		
SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)	SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)
SA-4	126,666	229,841	SAL-8	104,761	205,714
SA-9	133,650	234,920	SAL-1	104,761	204,444
SA-2	133,333	228,571	SAL-4	93,650	195,873
SA-5	126,984	228,253	SAL-6	101,587	182,539
SA-6	139,682	225,079	SAL-9	107,936	208,888
AVG.	132,063	229,332		102,539	199,491

NOTE:

22.3% decrease in bearing yield strength when lubricated.

13.0% decrease in bearing ultimate strength when lubricated.

TABLE VI

STEEL
851064

NOT LUBRICATED			LUBRICATED		
SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)	SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)
SB-3	101,587	208,571	SBL-9	111,111	193,650
SB-5	120,634	213,650	SBL-3	117,460	196,190
SB-4	129,841	214,920	SBL-7	104,761	199,365
SB-2	123,809	215,555	SBL-4	111,111	187,619
SB-7	128,571	215,873	SBL-5	117,460	187,619
AVG.	120,888	213,713		112,380	192,888

NOTE:

7.0% decrease in bearing yield strength when lubricated.

9.7% decrease in bearing ultimate strength when lubricated.

TABLE VII

STEEL
861104

NOT LUBRICATED			LUBRICATED		
SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)	SPECIMEN NO.	BEARING YIELD STRENGTH (PSI)	BEARING ULTIMATE STRENGTH (PSI)
SC-6	117,460	215,555	SCL-18	114,285	196,190
SC-4	123,174	216,507	SCL-12	104,761	193,015
SC-7	120,634	219,047	SCL-15	107,936	191,111
SC-3	125,396	219,047	SCL-17	111,111	186,349
SC-5	128,235	226,349	SCL-11	111,111	205,079
AVG.	123,047	219,301		109,840	194,348

NOTE:

10.7% decrease in bearing yield strength when lubricated.

11.3% decrease in bearing ultimate strength when lubricated.

TABLE VIII

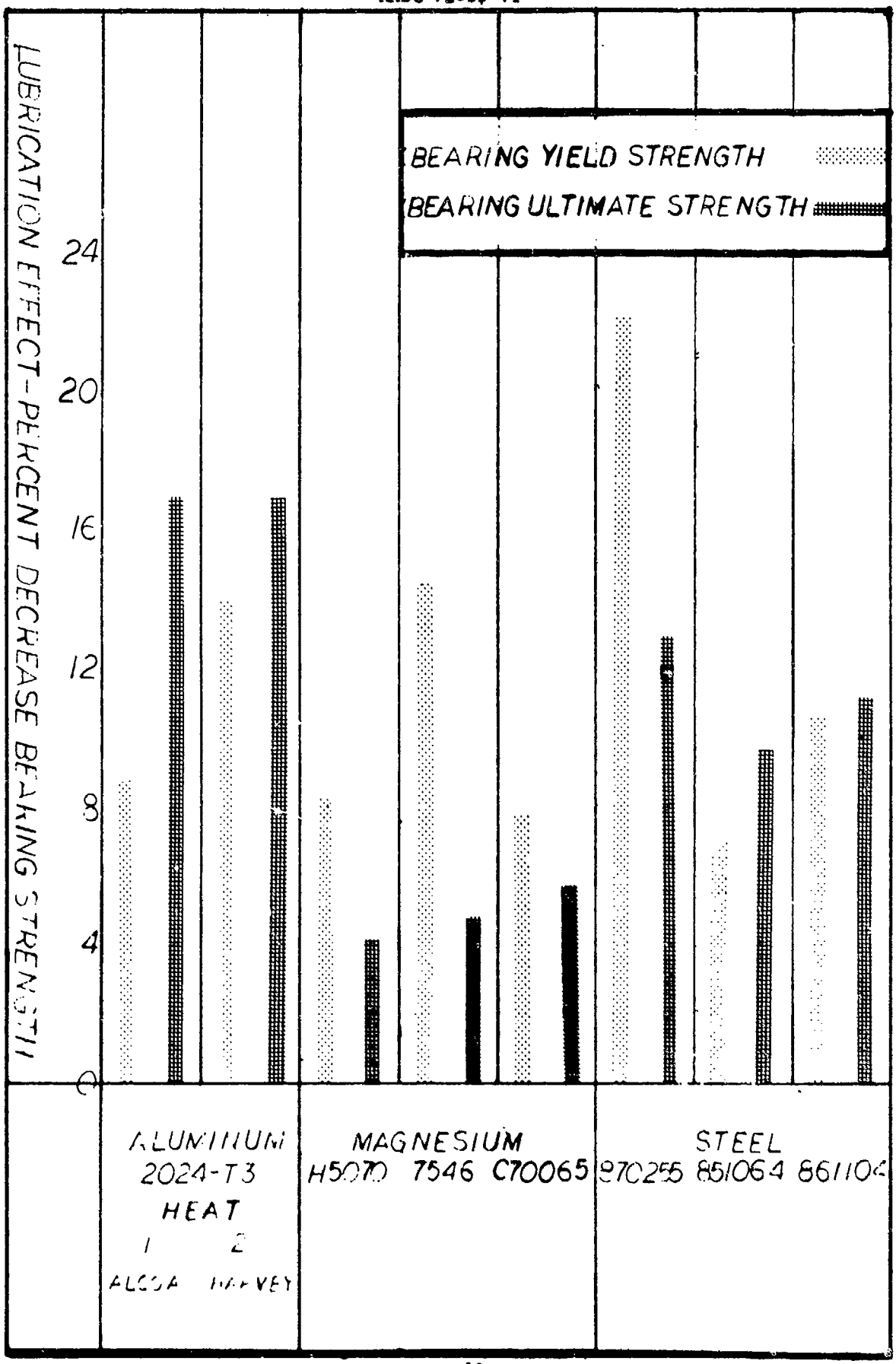
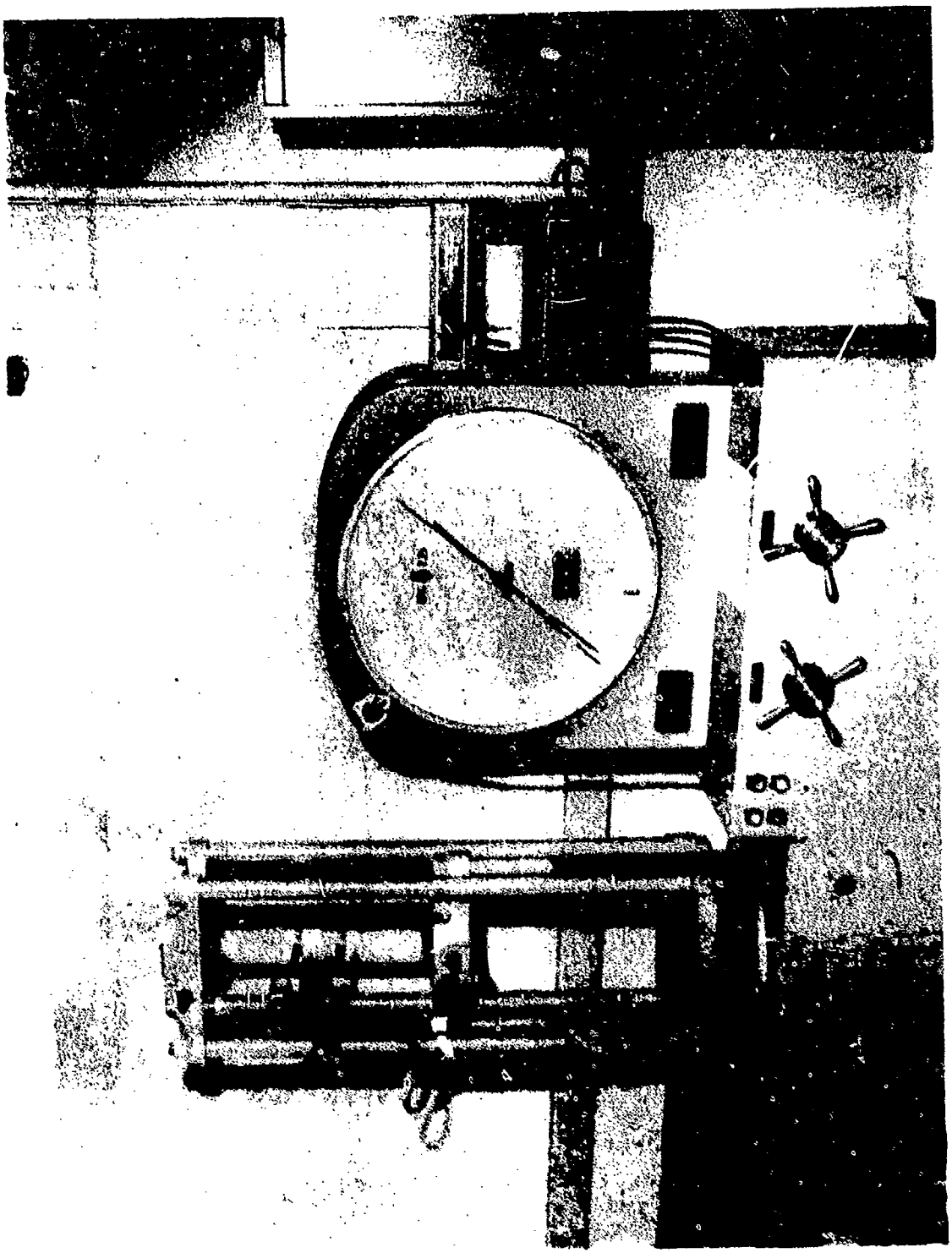

LUBRICATION EFFECT-PERCENT DECREASE BEARING STRENGTH
0
4
8
12
16
20
24
BEARING YIELD STRENGTH
BEARING ULTIMATE STRENGTH
ALUMINUM
2024-T3
HEAT
1
2
ALCOA
HARVEY
MAGNESIUM
H5070
7546
C70065
STEEL
970255
851064
861104

TABLE IX



TINIUS OLSEN 60,000 LB. UNIVERSAL TESTING MACHINE

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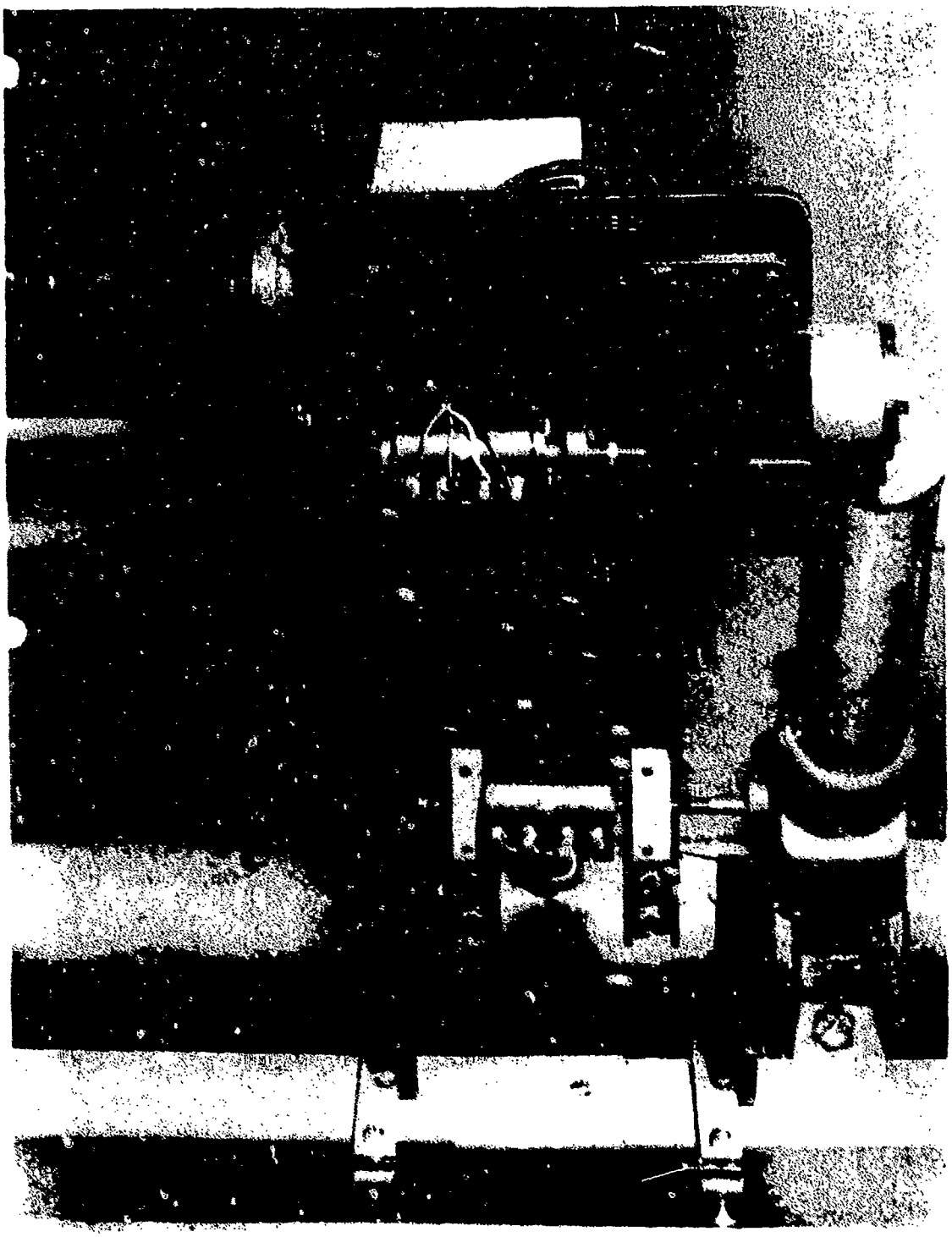
FIGURE 1



TEST FIXTURE

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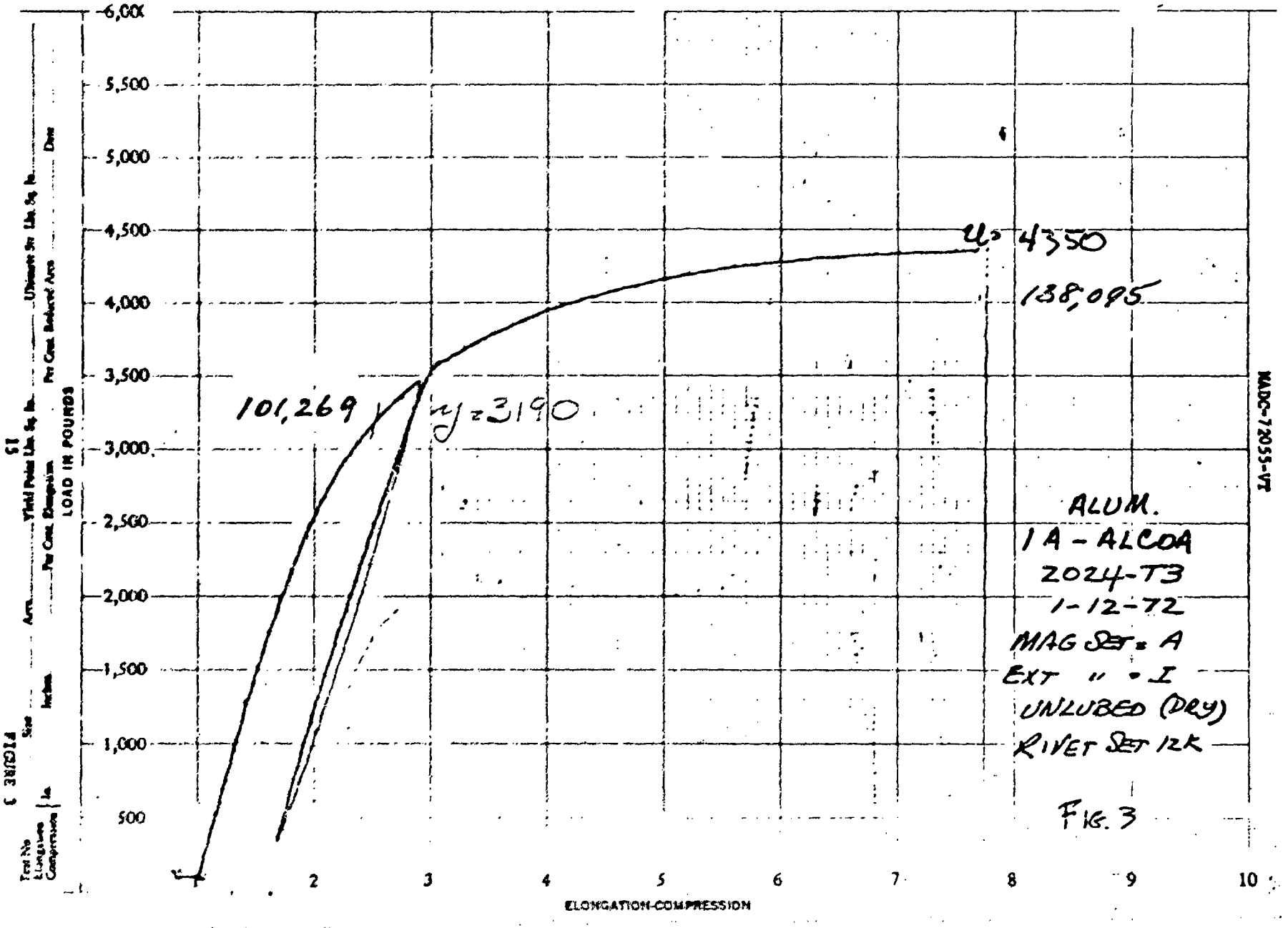
best available copy.

FIGURE 2


6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
MADC-72055-VT
101,269
Uy = 3190
Uu 4350
138,095
ALUM.
1A - ALCOA
2024-T3
1-12-72
MAG SET = A
EXT " = I
UNLUBED (DRY)
RIVET SET 12K
FIG. 3

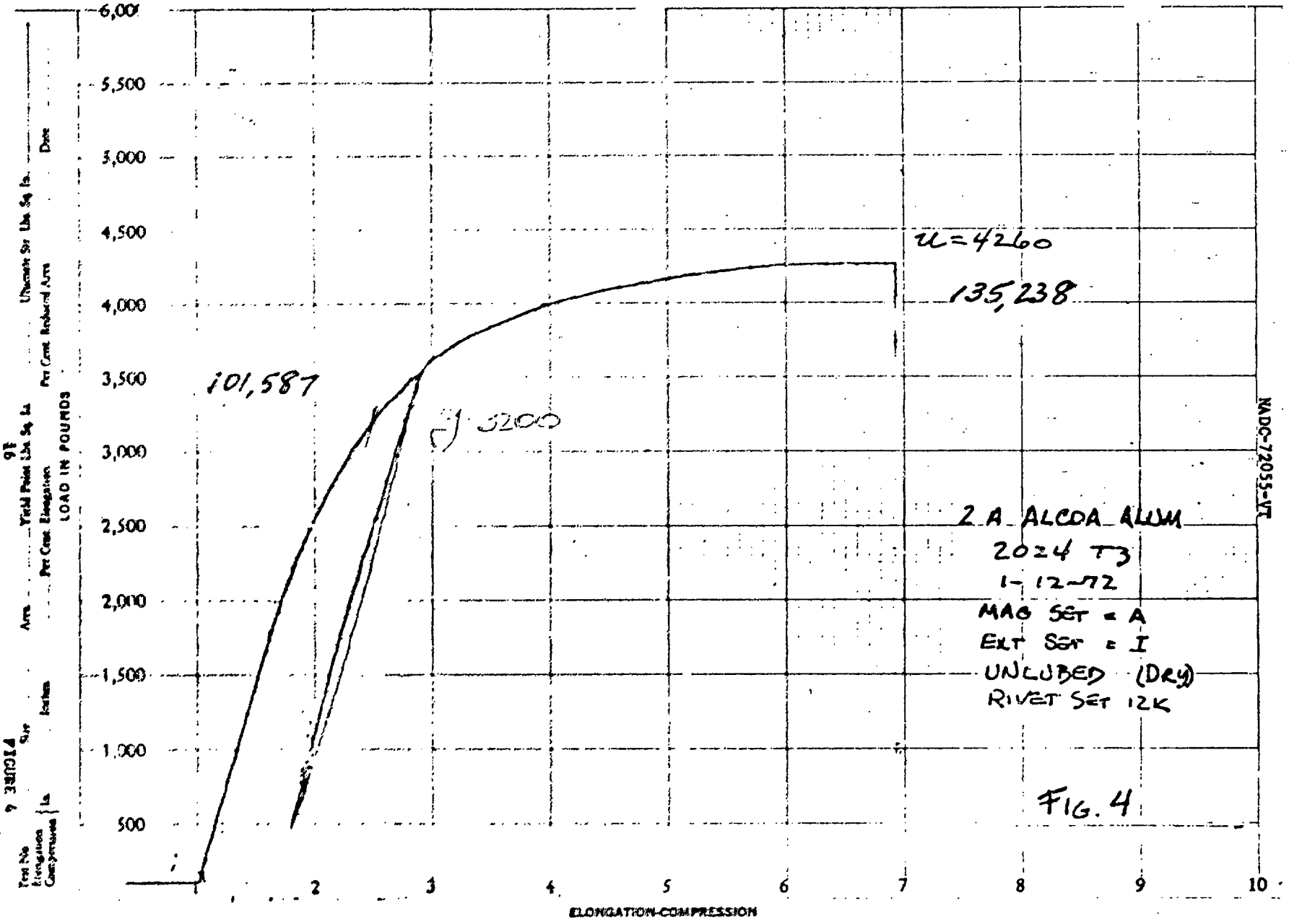

6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
101,587
E 3200
U=4260
135,238
2A ALCOA ALUM
2024 T3
1-12-72
MAG SET = A
ELT SET = I
UNLUBED (DRY)
RIVET SET 12K

FIG. 4

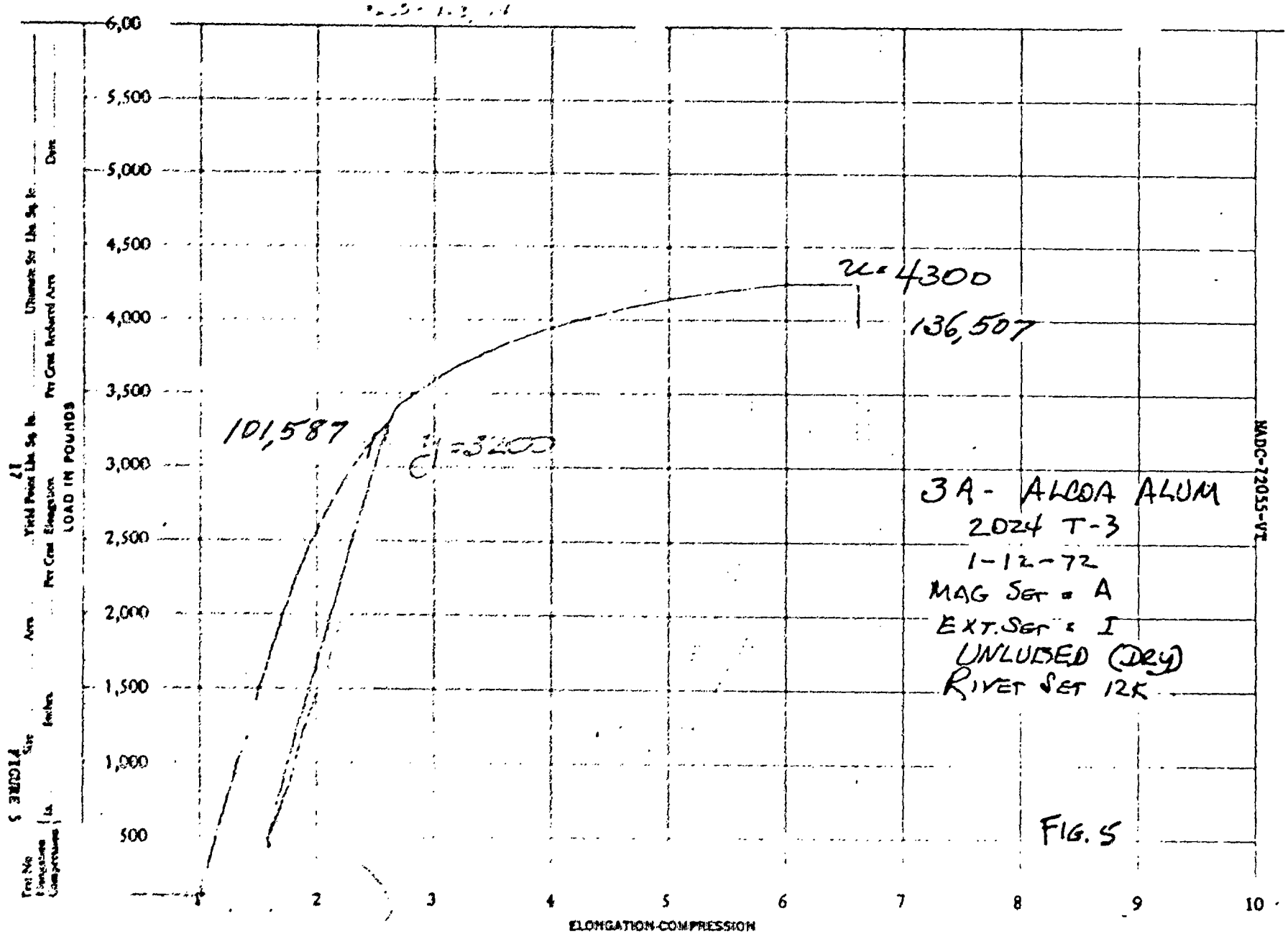

LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
101,587
136,507
3A - ALCOA ALUM
2024 T-3
1-12-72
MAG SET = A
EXT. SET = I
UNLUBED (DRY)
RIVET SET 12K
MADC-72055-VL

FIG. 5

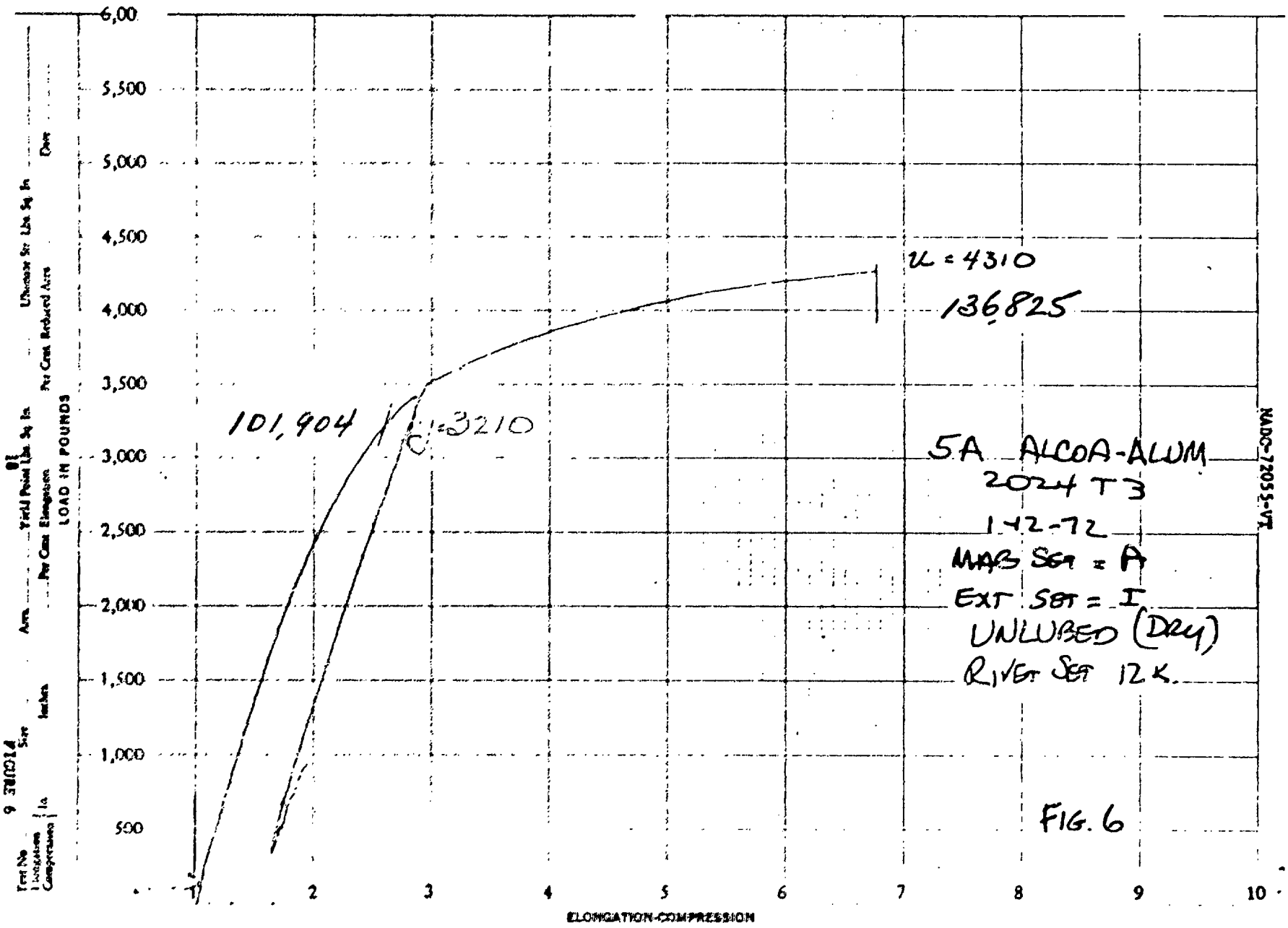

6,00
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
u = 4310
136825
101,904
= 3210
5A ALCOA-ALUM
2024 T3
1.42-72
MAB SGT = A
EXT SET = I
UNLUBED (DRY)
RIVET SET 12K.

FIG. 6

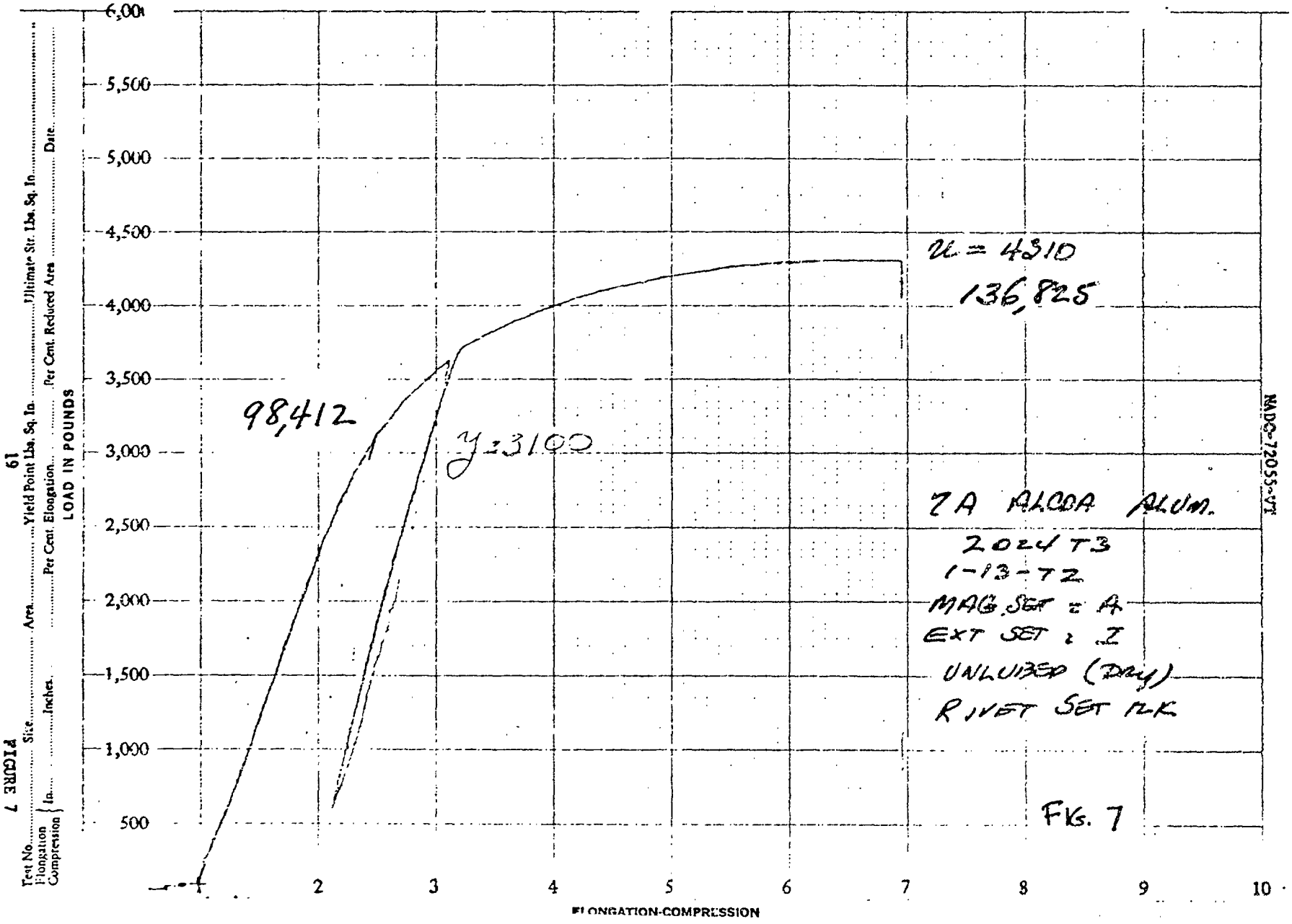

Test No. 61
Elongation
Compression } In.
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Per Cent. Elongation
Per Cent. Reduced Area
Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
98,412
y=3100
u = 4310
136,825
7A ALCOA ALUM.
2024 T3
1-13-52
MAG. SET = A
EXT SET = I
UNLUBED (DRY)
RIVET SET RK
Fig. 7
MADC-72055-VT

FIGURE 7

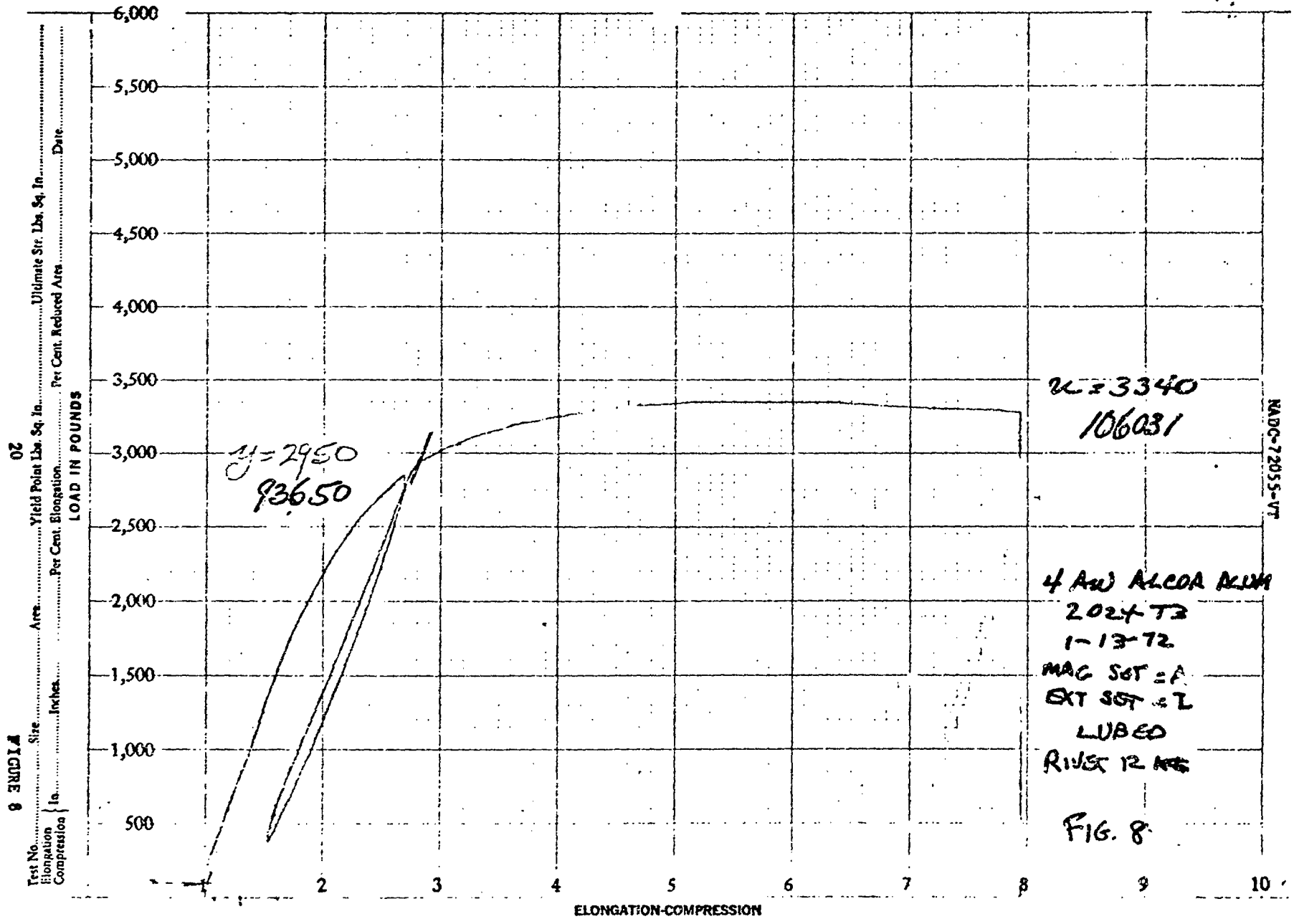
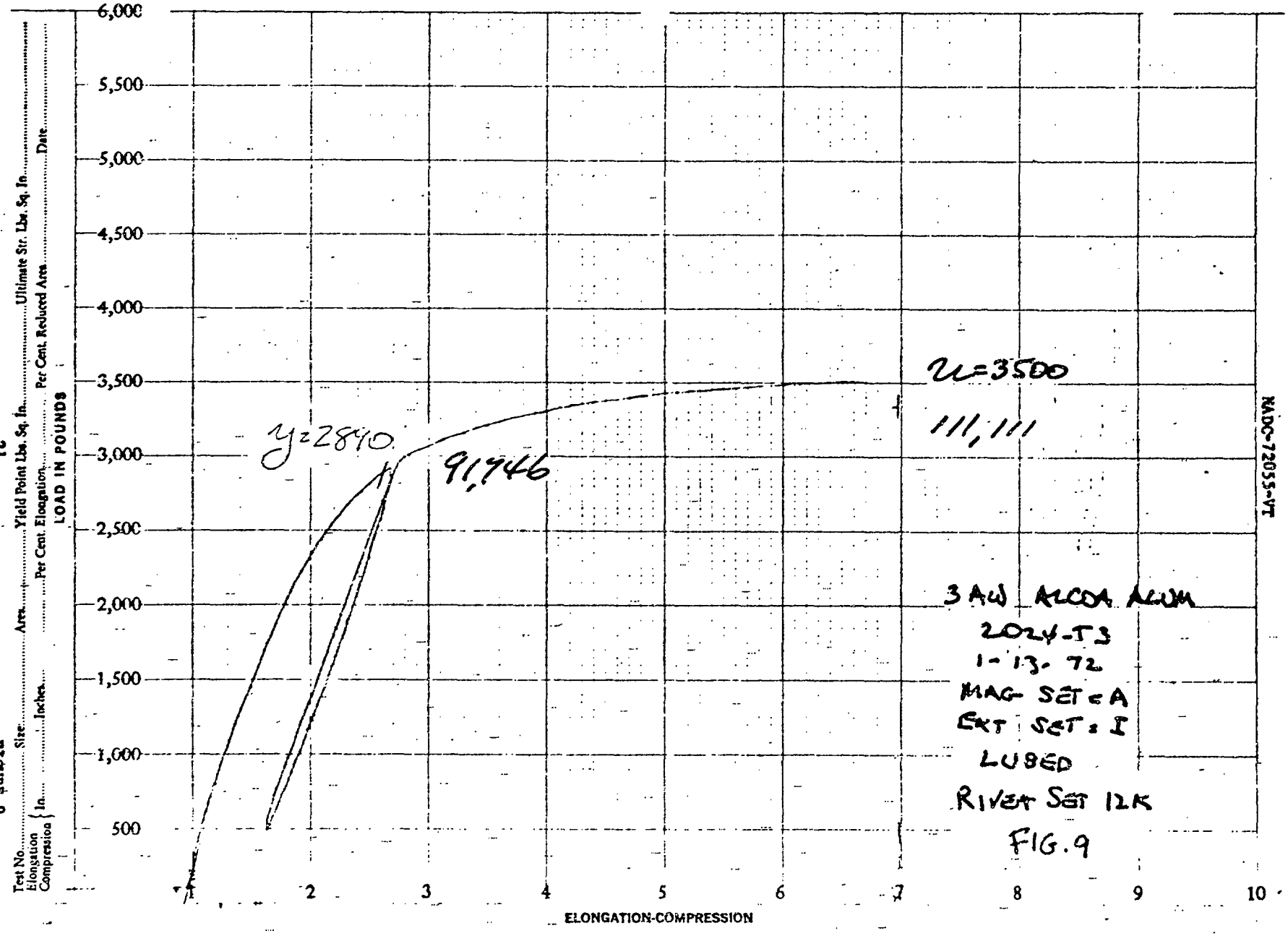


FIGURE 8
Test No.
Elongation
Compression
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Per Cent. Elongation
Per Cent. Reduced Area
Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
Y=2950
93650
U=3340
106031
4 AN ALCOA ALUM
2024-T3
1-13-72
MAG SET = A
EXT SET = L
LUBED
RIVET 12 NE
FIG. 8


6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No. 21
Elongation
Compression
In.
Size
Area
Inches
Yield Point Lbs. Sq. In.
Per Cent. Elongation
Ultimate Str. Lbs. Sq. In.
Per Cent. Reduced Area
Date
FIGURE 9
NADC-72055-VT
y=2840
91,746
u=3500
111,111
3AW ALCOA ALUM
2024-T3
1-13-72
MAG SET=A
EXT SET=I
LUBED
RIVET SET 12K
FIG.9

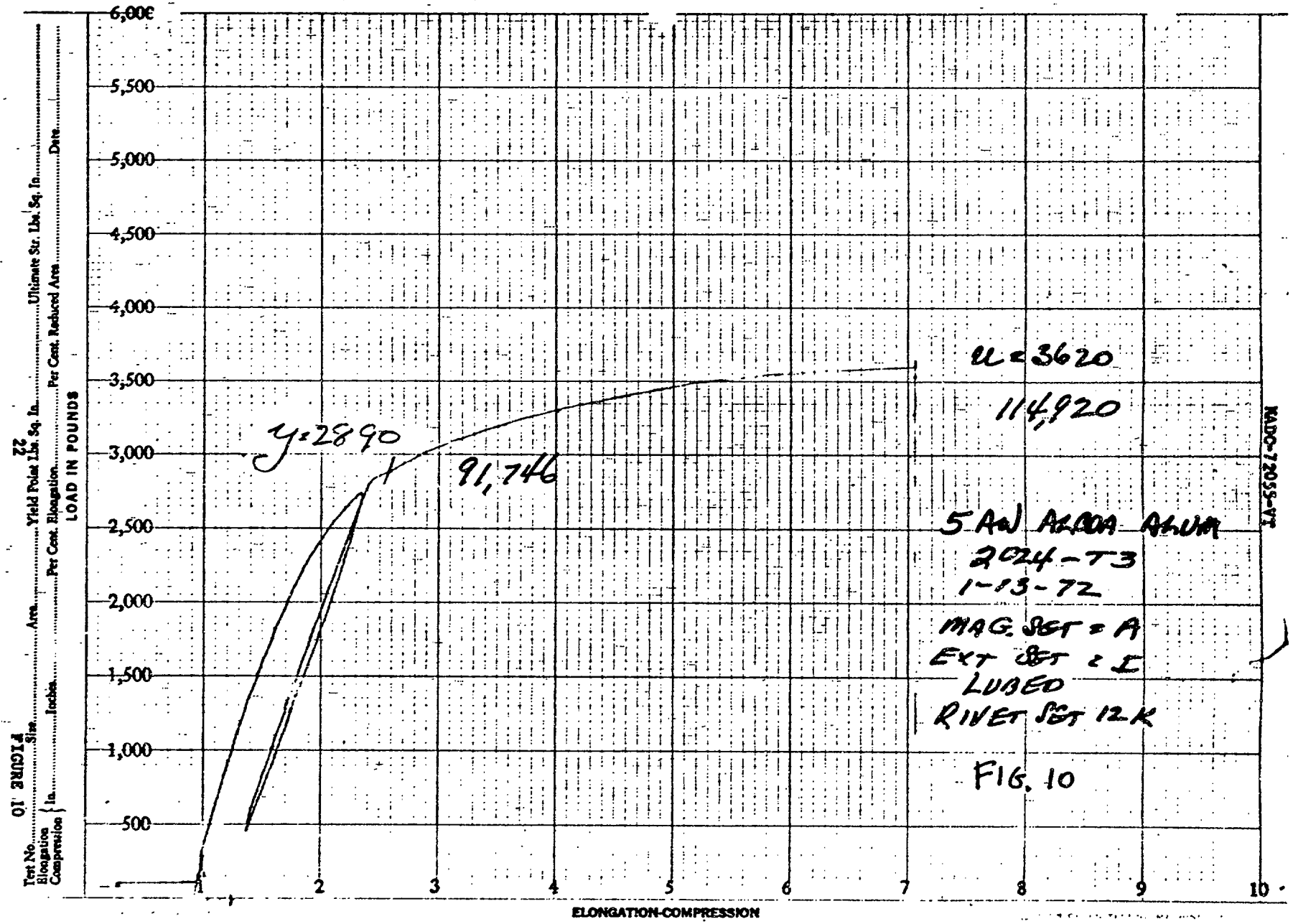


FIGURE 10
Test No. 22
Size ... Area ... Yield Point Lbs. Sq. In. ... Ultimate Str. Lbs. Sq. In. ...
Elongation (In. ... Inches ... Per Cent. Elongation ... Per Cent. Reduced Area ... Date ...
Compression)
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
y=2890
91,746
u=3620
114,920
5AN ALCOA ALUM
2024-T3
1-13-72
MAG. SET = A
EXT SET = E
LUBED
RIVET SET 12K
FIG. 10
NADC-12055-VT

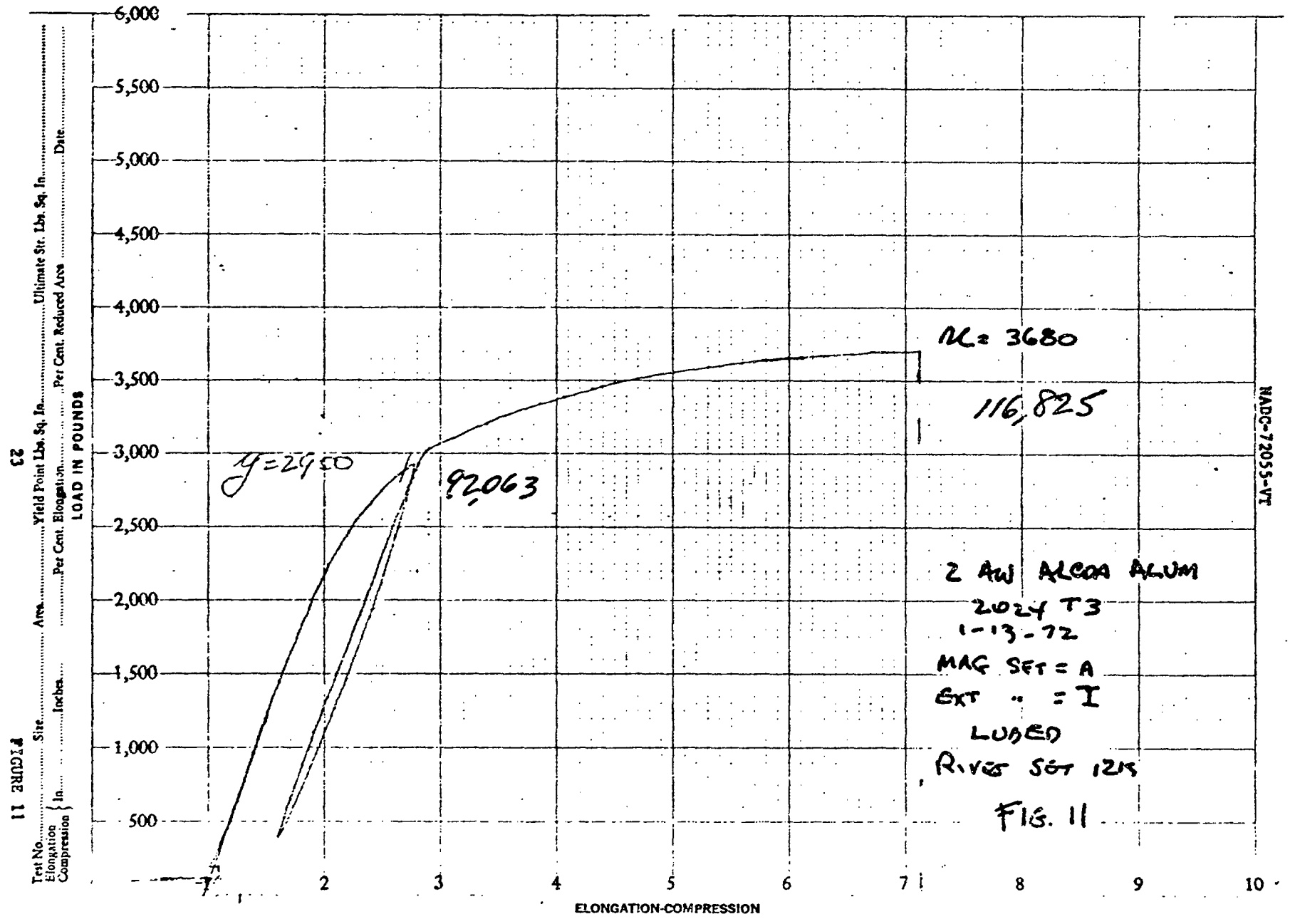

Test No. ..... Site. ..... Area. ..... Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. .....
Elongation } In. ..... Inches. ..... Per Cent. Elongation. ..... Per Cent. Reduced Area ..... Date. .....
Compression
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
M = 3680
116,825
y = 2950
92,063
2 AW ALCOA ALUM
2024 T3
1-13-72
MAG SET = A
EXT " = I
LUBED
RIVES SET 12%
FIG. 11

FIGURE 11

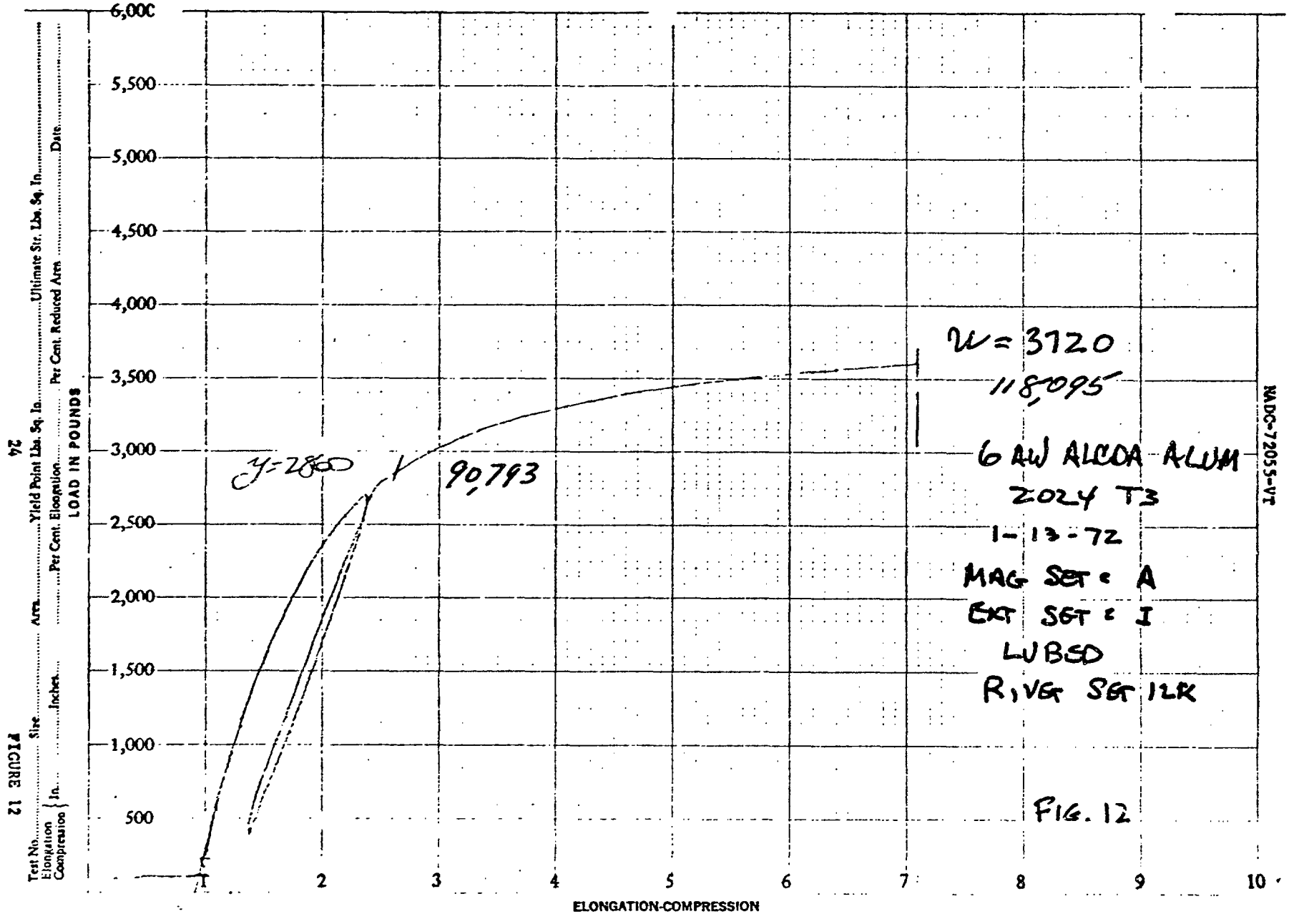

6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No. ..... Size ..... Area ..... Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. .....
Elongation } In. ..... Inches ..... Per Cent. Elongation ..... Per Cent. Reduced Area ..... Date .....
Compression }
24
FIGURE 12
NADC-7205-VT
W = 3720
118,095
6 AW ALCOA ALUM
2024 T3
1-13-72
MAG SET = A
EXT SET = I
LUBSD
RIVET SET 12R
Y=2850
90,793

FIG. 12

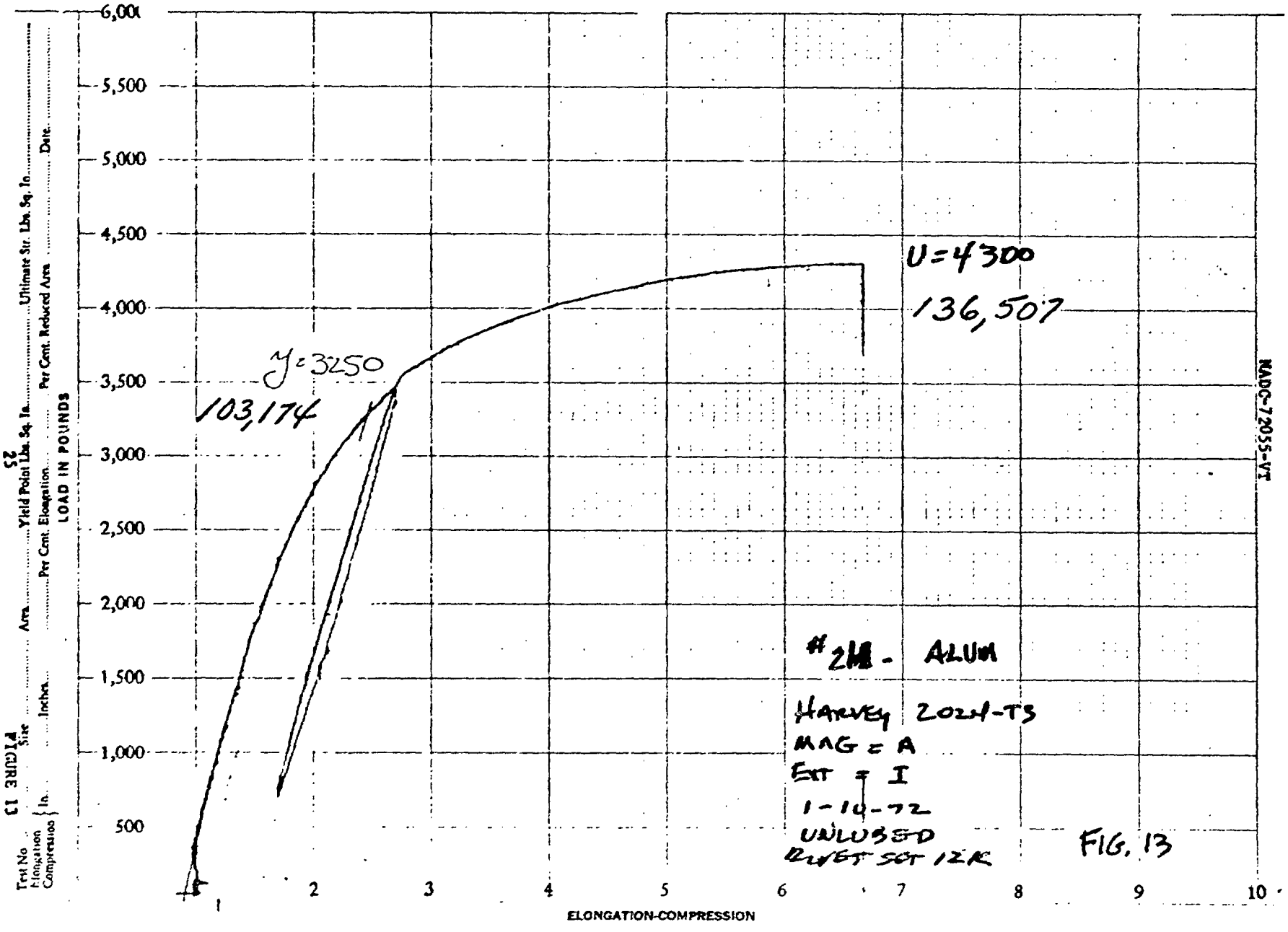

Test No
Elongation
Compression
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
In.
Inches
Per Cent. Elongation
Per Cent. Reduced Area
Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Y=3250
103,174
U=4300
136,507
#2M - ALUM
HARVEY 2024-T3
MAG = A
EXT = I
1-14-72
UNUSED
RIVET SET 12K
NADC-72055-VT

FIG. 13

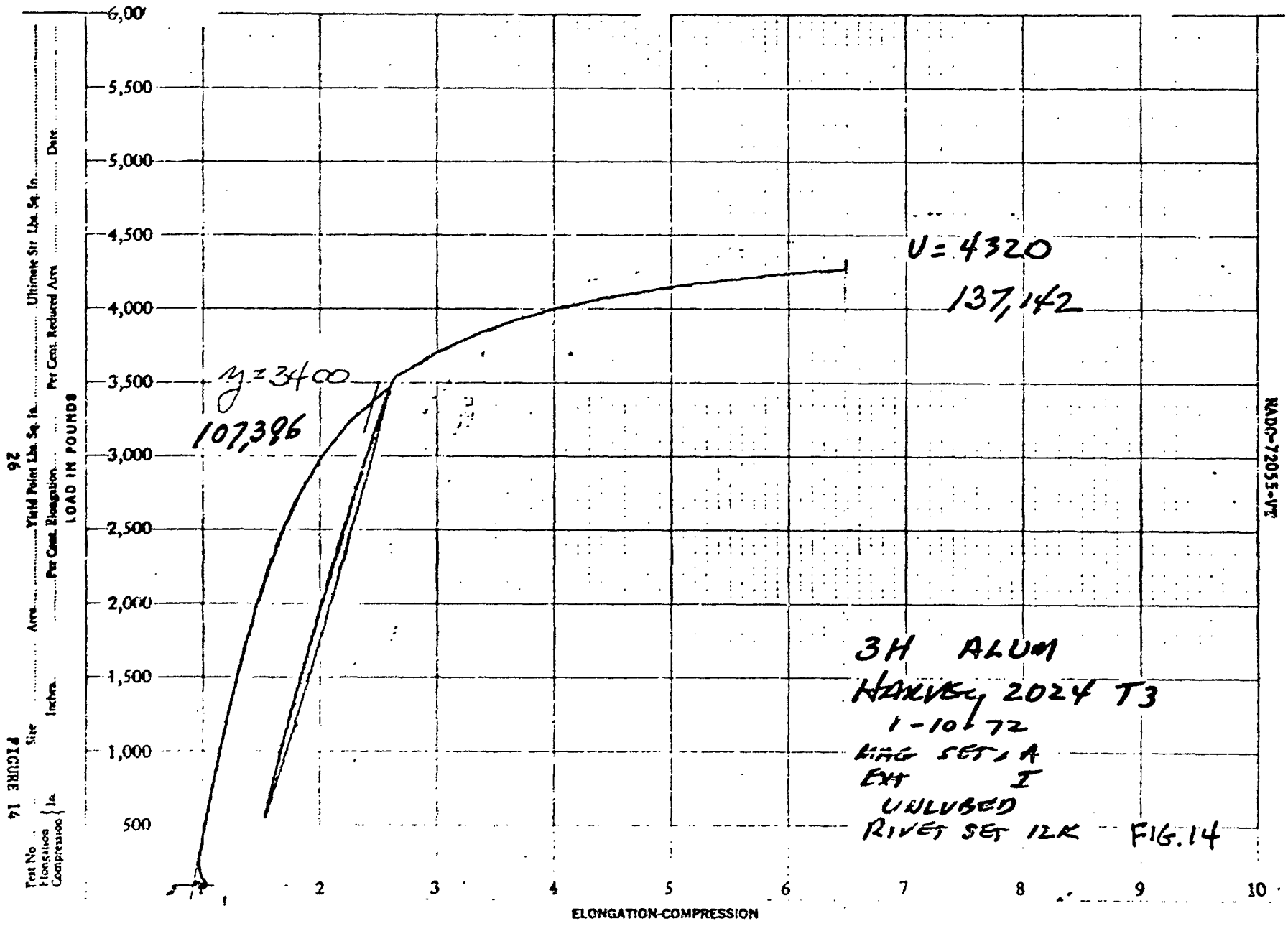

6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No.
Elongation / In.
Compression
Size
Area
Inches
Yield Point Lbs. Sq. In.
Per Cent. Elongation
Ultimate Str. Lbs. Sq. In.
Per Cent. Reduced Area
Date
NADC-72055-VT
y = 3400
107,386
U = 4320
137,142
3H ALUM
HARVEY 2024 T3
1-10-72
MAG SET, A
EXT I
UNLUBED
RIVET SET 12K
FIG. 14

FIGURE 14

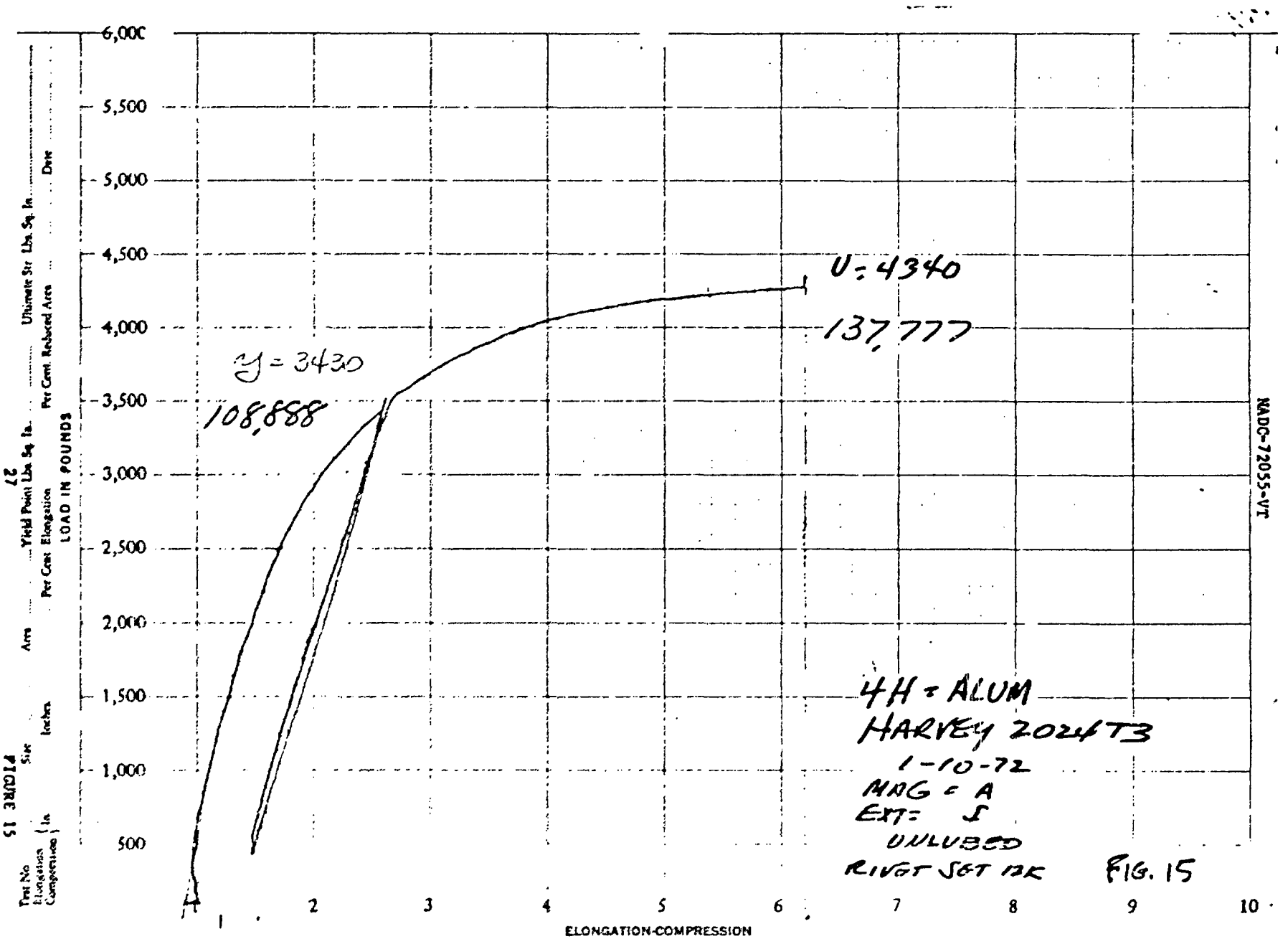

6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No
Elongation (In Compression)
Size
Inches
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Per Cent Elongation
Per Cent Reduced Area
Date
27
NADC-72055-VT
y = 3420
108,888
U = 4340
137,777
4H = ALUM
HARVEY 2024 T3
1-10-72
MAG = A
EXT = S
UNLUBED
RIVET SET RK

FIG. 15

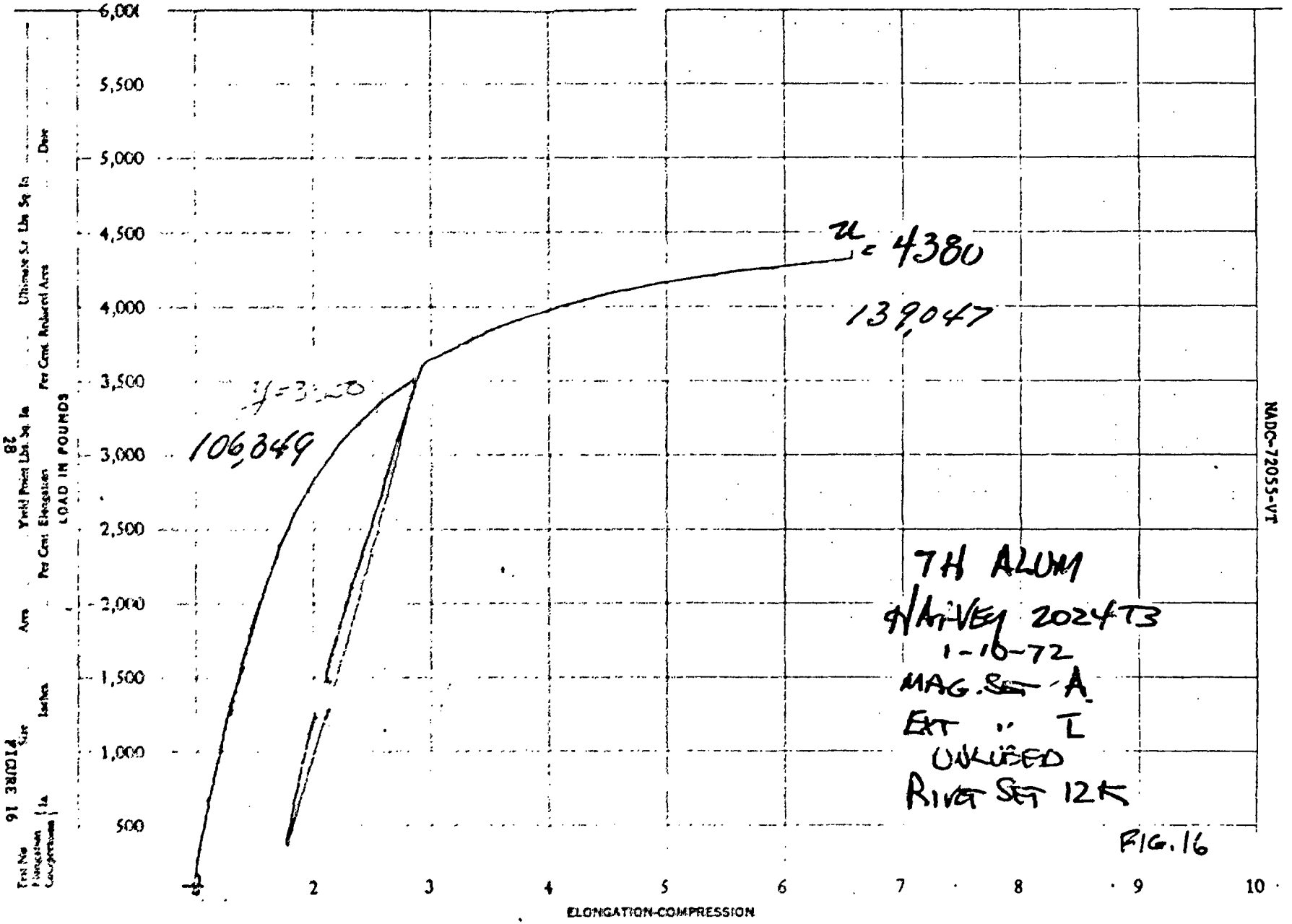
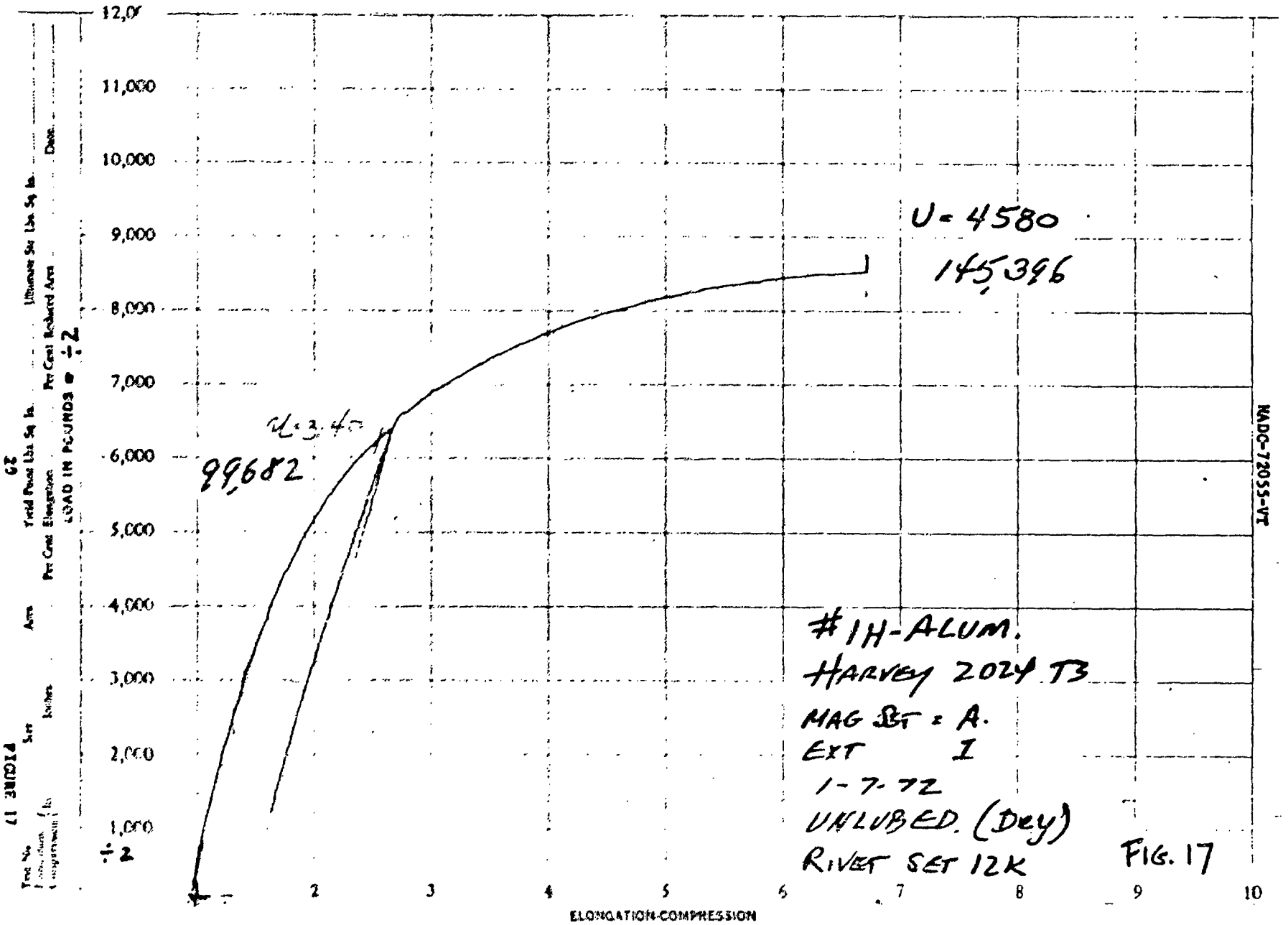
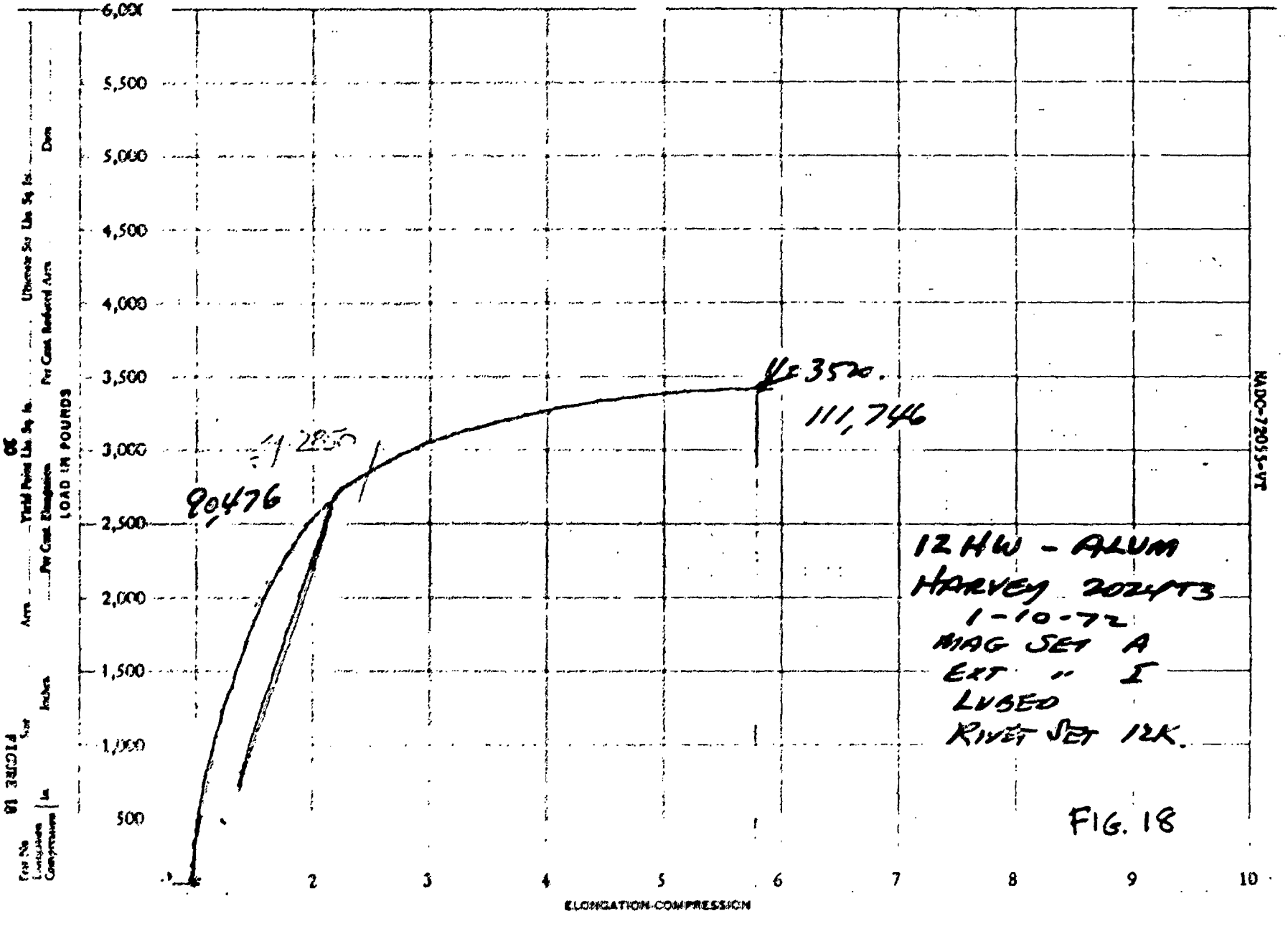

6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
u = 4380
139,047
y = 3120
106,849
7H ALUM
HARVEY 2024T3
1-10-72
MAG. SET - A
EXT. - L
UNUSED
RIVET SET 12K

FIG. 16


12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
÷ 2
LOAD IN POUNDS ÷ 2
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
U = 4580
145,396
U = 3.40
99,682
#1H-ALUM.
HARVEY 2024 T3
MAG SET = A.
EXT I
1-7-72
UNLUBED. (DRY)
RIVET SET 12K
FIG. 17


LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
90476
=1.285
Ult 3520.
111,746
12 HW - ALUM
HARVEY 2024T3
1-10-72
MAG SET A
EXT - I
LUBED
RIVET SET 12K.
FIG. 18

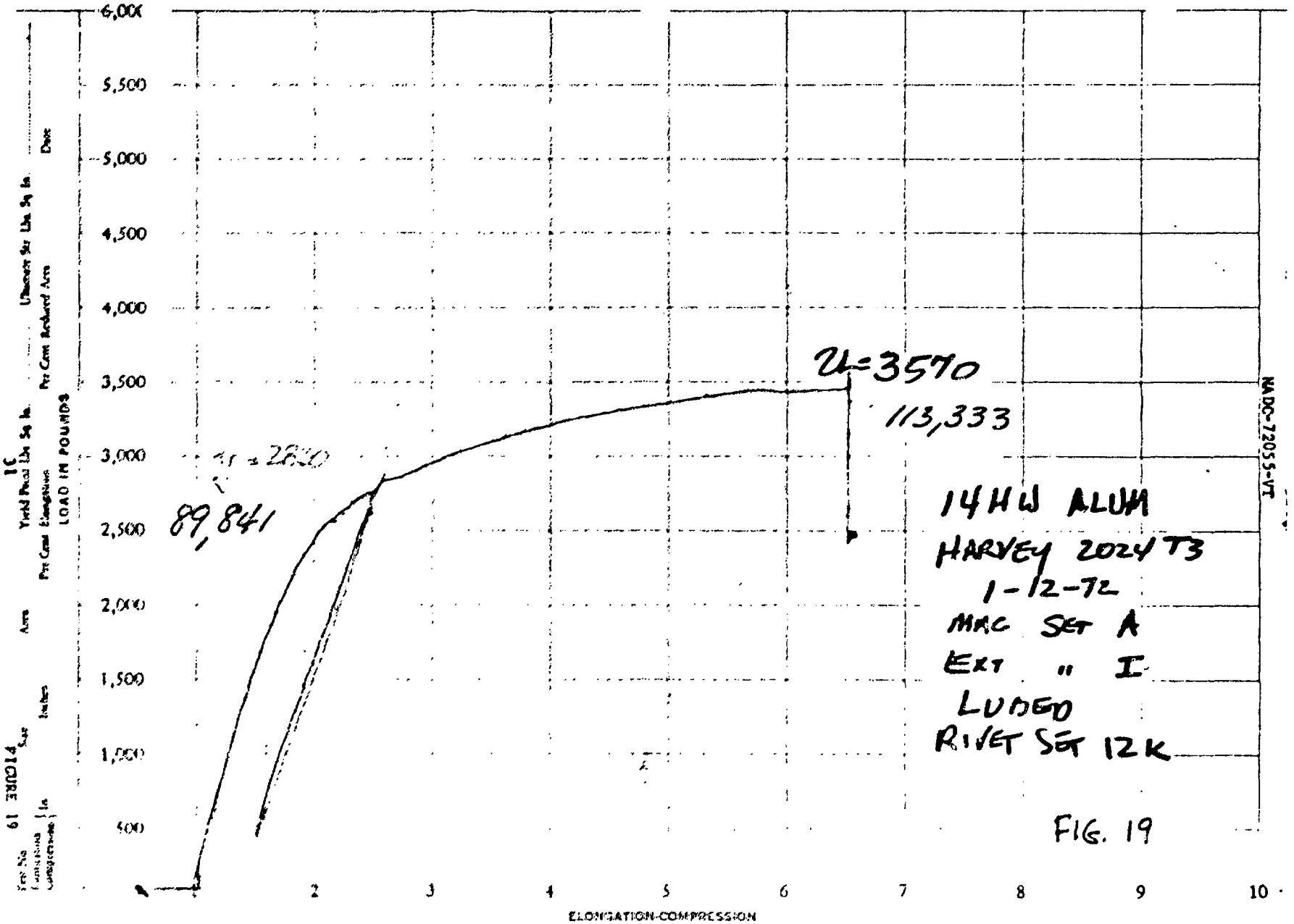

6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
89,841
U=3570
113,333
14HW ALUM
HARVEY 2024 T3
1-12-72
MAC SET A
EXT " I
LUDED
RIVET SET 12K

FIG. 19

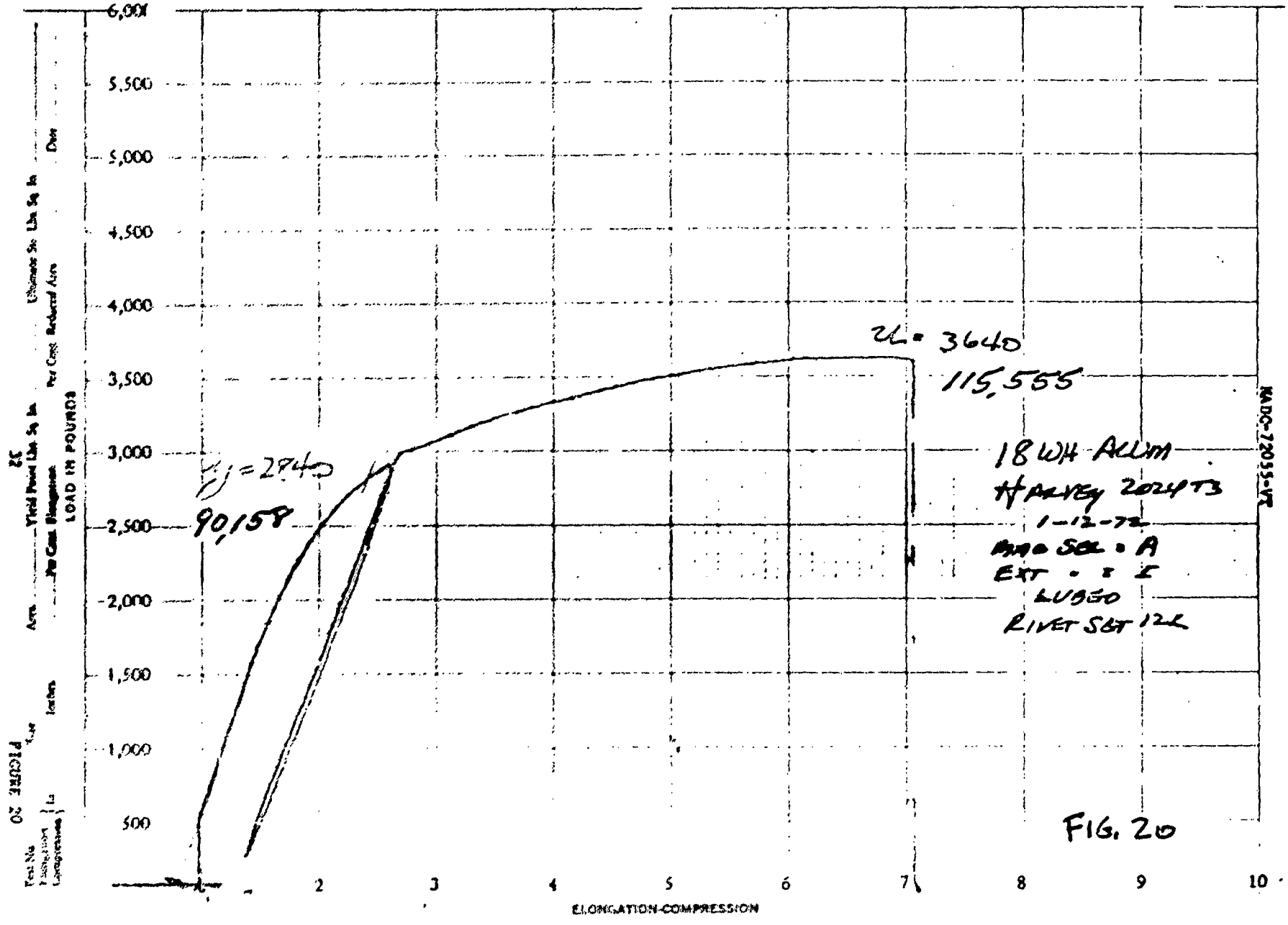

6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
MADC-72055-VT
FIGURE 20
2L = 3640
115,555
18WH ALUM
HARVEY 2024T3
1-12-72
MAG SOL • A
EXT • 2 E
LUGGO
RIVET SET 12L
90,158

FIG. 20

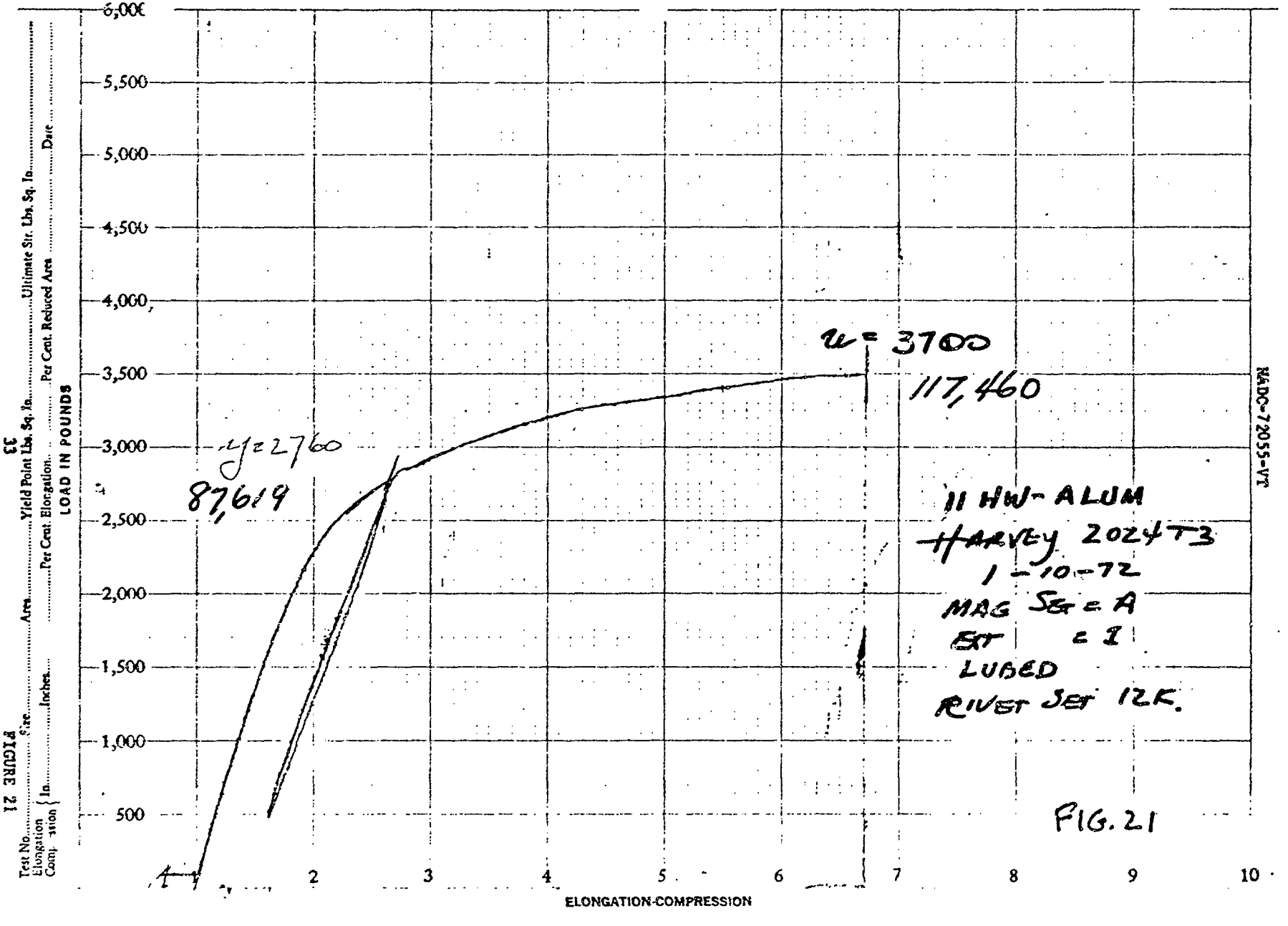
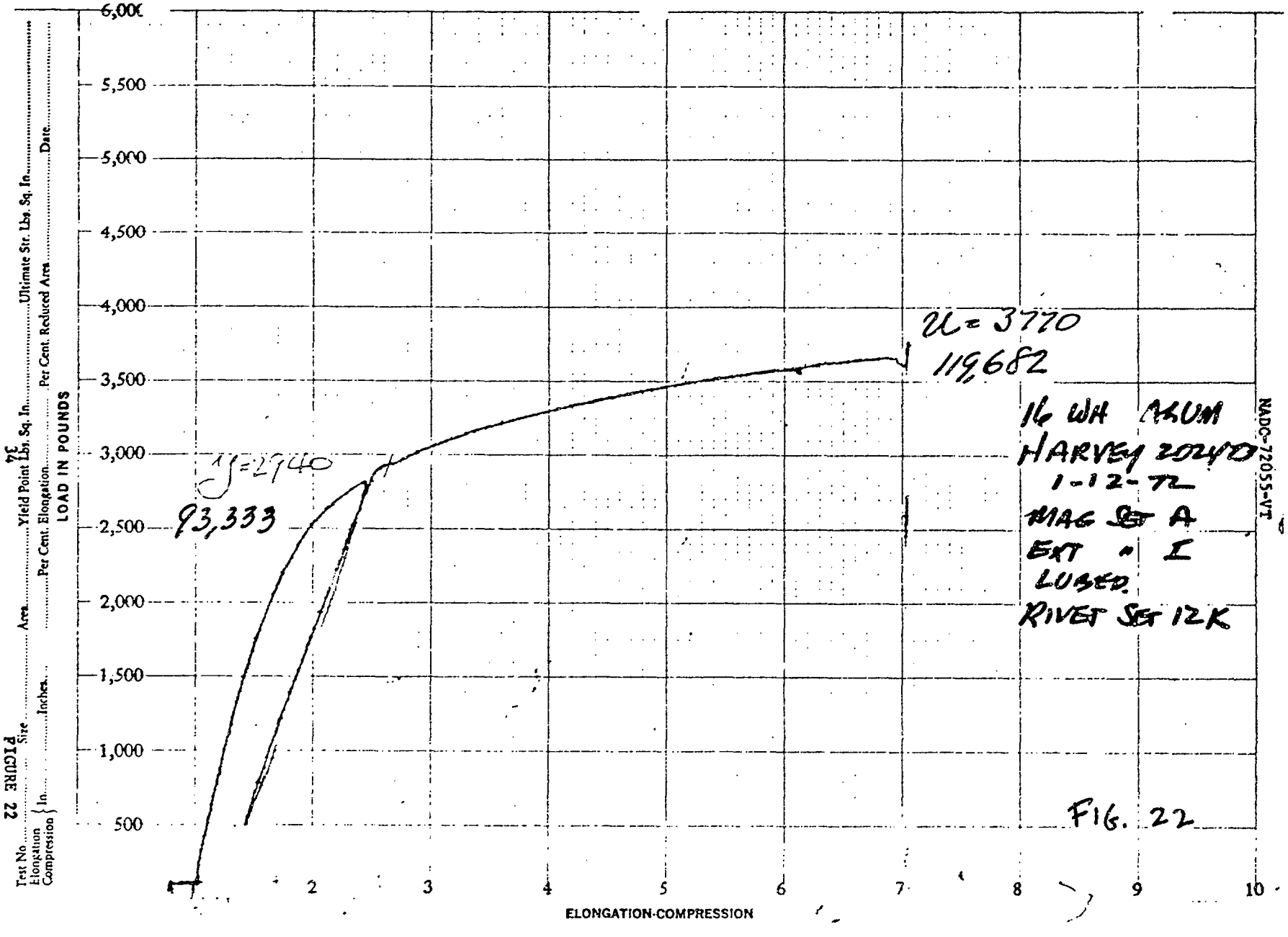


FIGURE 21
Test No.
Elongation
Compression
Size
In.
Inches
Area
Per Cent Elongation
Yield Point Lbs. Sq. In.
Per Cent. Reduced Area
Ultimate Str. Lbs. Sq. In.
Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
u = 3700
117,460
y = 2760
87,619
11 HW-ALUM
HARVEY 2024 T3
1-10-72
MAG SET = A
EXT = I
LUBED
RIVET SET 12K.
FIG. 21
NADC-72055-VT


6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1 2 3 4 5 6 7 8 9 10
ELONGATION-COMPRESSION
Test No. ..... Size ..... Area ..... Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. .....
Elongation } In. ..... Inches. ..... Per Cent. Elongation ..... Per Cent. Reduced Area ..... Date. .....
Compression }
FIGURE 22
NADC-72055-VT
U = 3770
119,682
16 WH ALUM
HARVEY 20240
1-12-72
MAG SET A
EXT - I
LUBED.
RIVET SET 12K
93,333
Y = 2940
FIG. 22

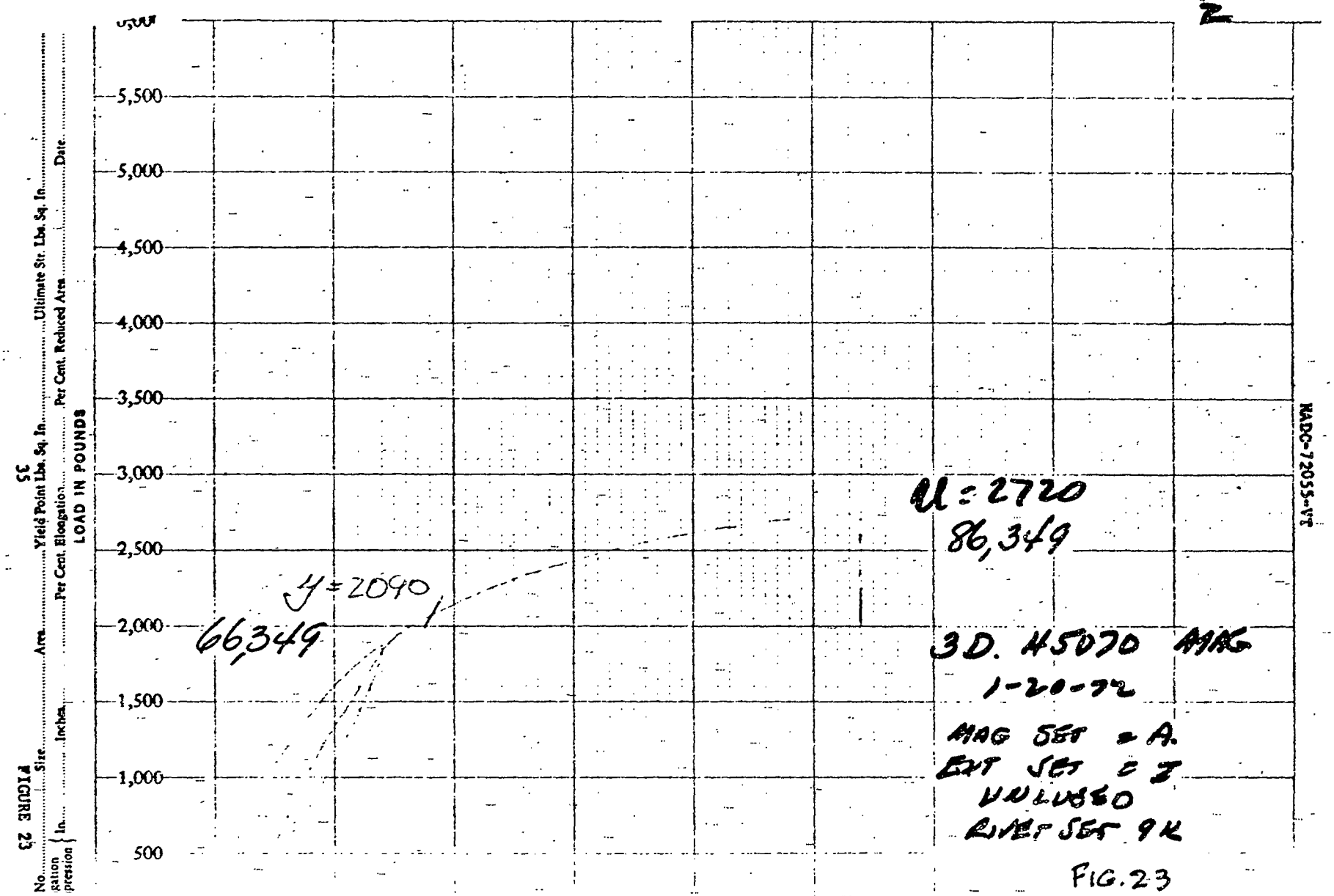


FIGURE 23
No. 35
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Gage Inches
Per Cent. Elongation
Per Cent. Reduced Area
Date
LOAD IN POUNDS
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
U = 2720
86,349
Y = 2090
66,349
3D. 45070 MAG
1-20-72
MAG SET = A.
EXT SET = J
UNLOAD
RUN SET 9K
NADC-72055-5T
FIG. 23

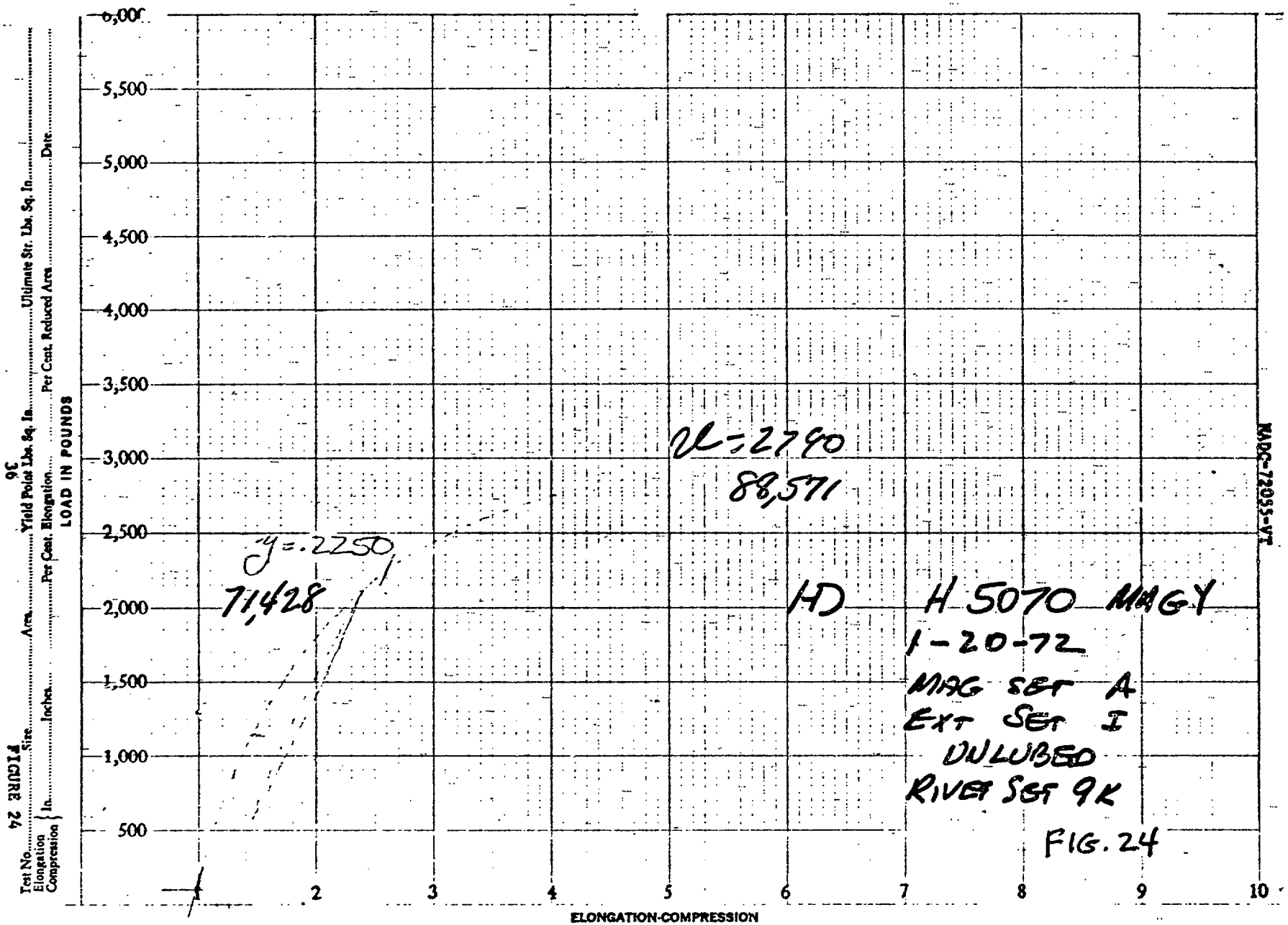
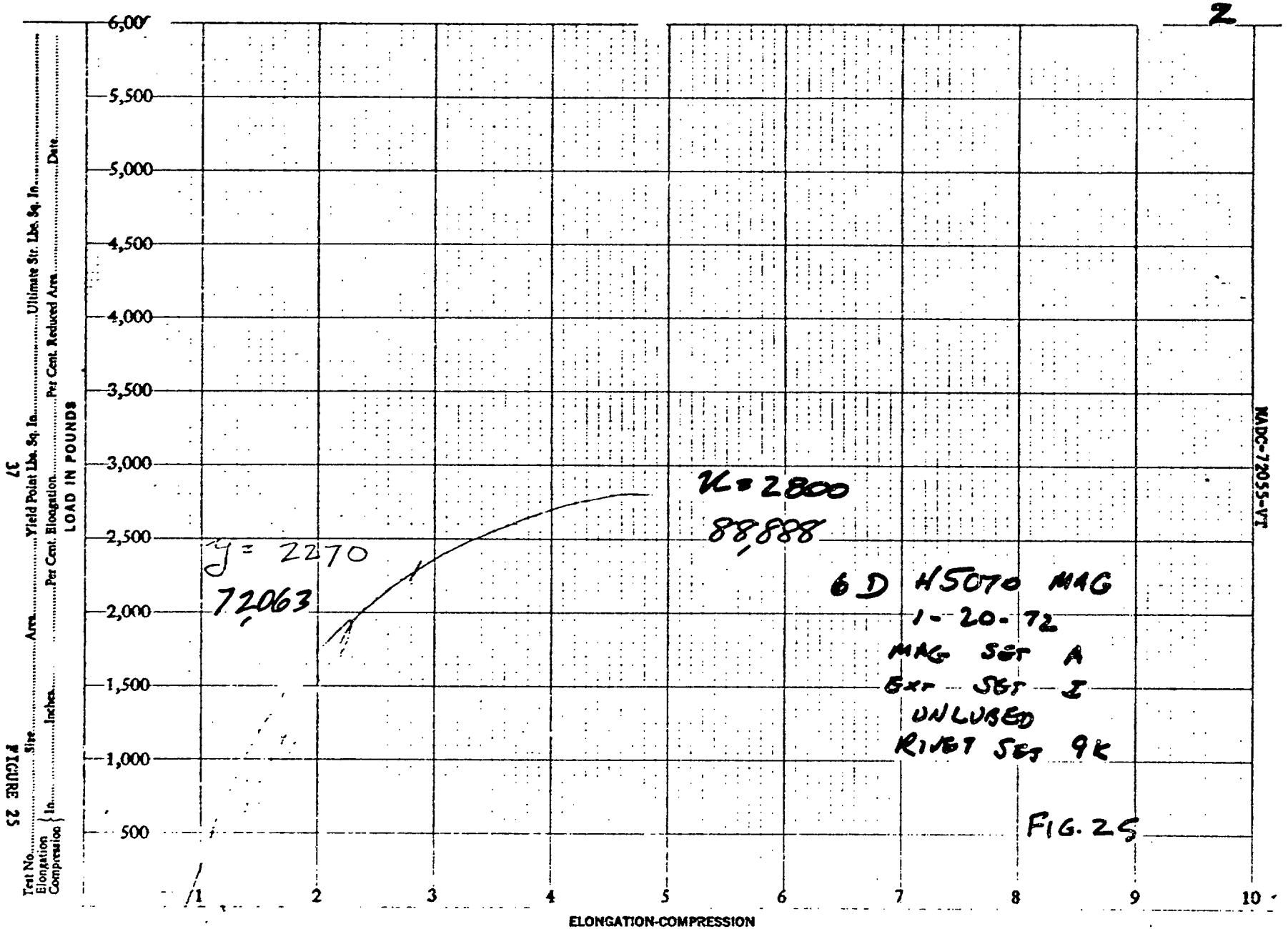

Test No.
Elongation
Compression
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
In.
Inches
Per Cent. Elongation
Per Cent. Reduced Area
Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
MADC-72055-VT
y=.2250
71,428
u=2790
88,571
HD H 5070 MAGY
1-20-72
MAG SET A
EXT SET I
UNLUBED
RIVET SET 9K
FIG. 24

FIGURE 24


6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
MADC-72055-VT
Test No. ..... Size ..... Area ..... Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. .....
Elongation } In. ..... Per Cent. Elongation ..... Per Cent. Reduced Area ..... Date .....
Compression } Inches .....
FIGURE 25
37
K = 2800
88,888
y = 2270
72,063
6D H5070 MAG
1-20-72
MAG SET A
EXT SET I
UNLUBED
RIVET SET 9K
FIG. 25

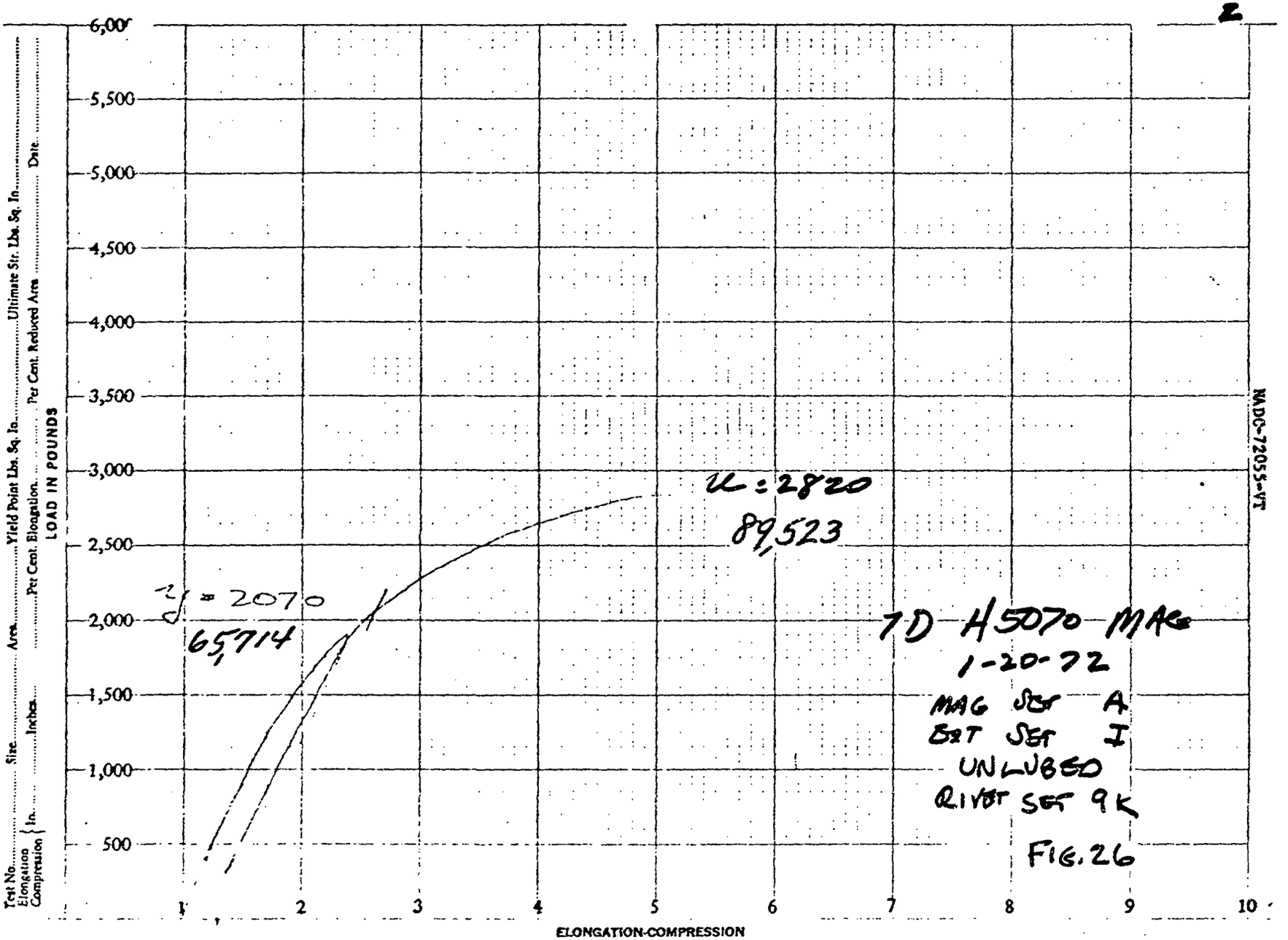
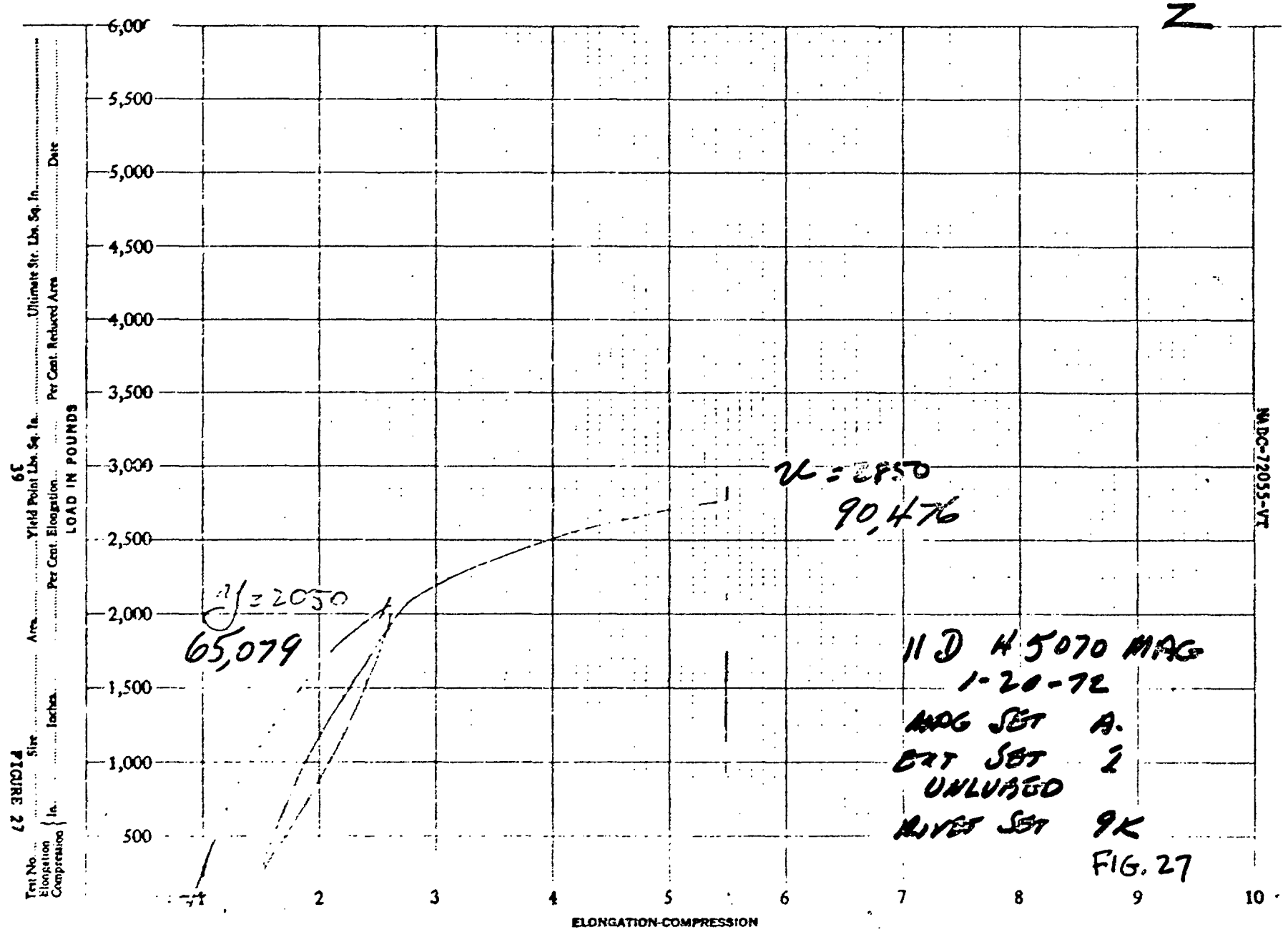
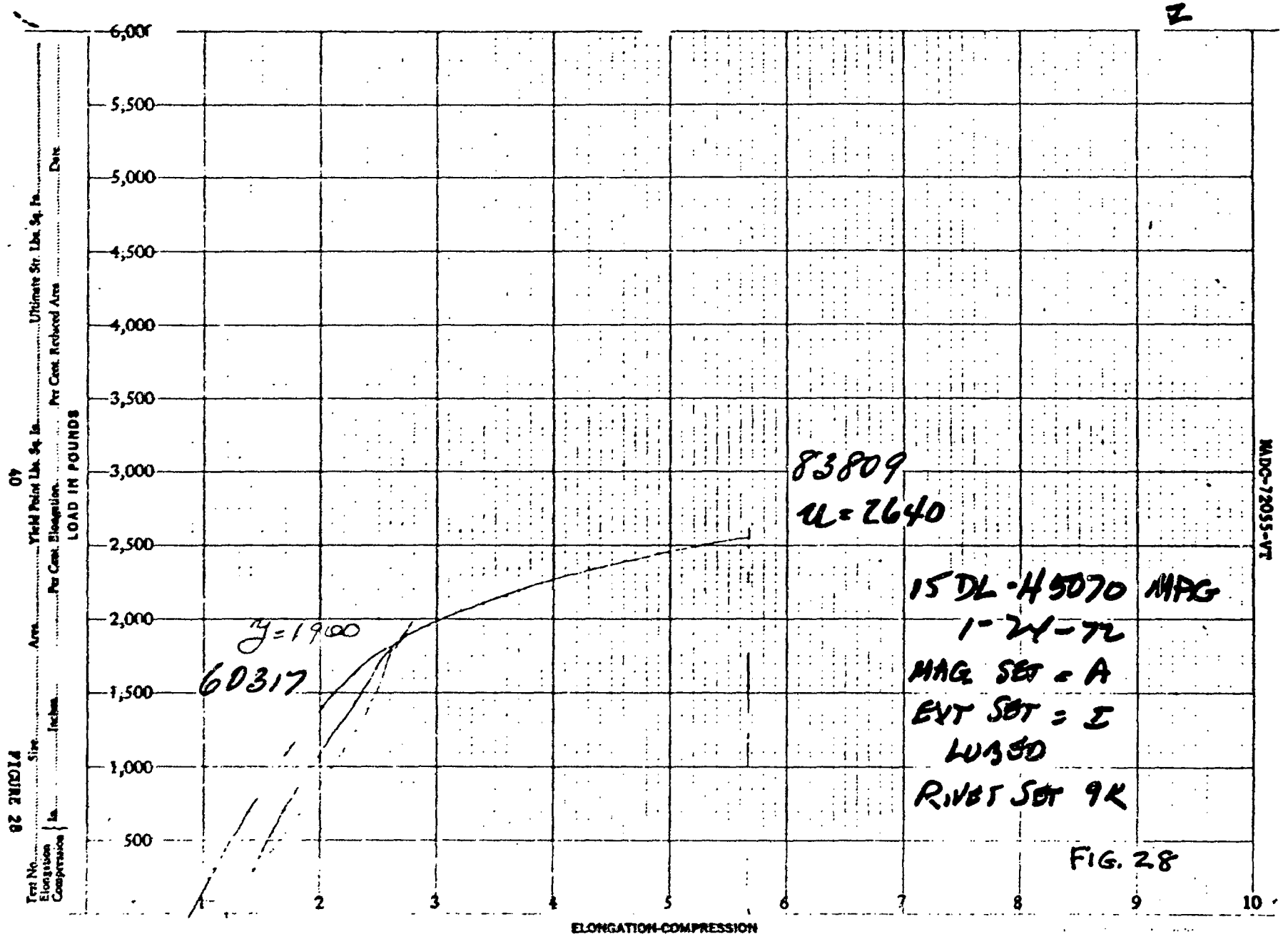
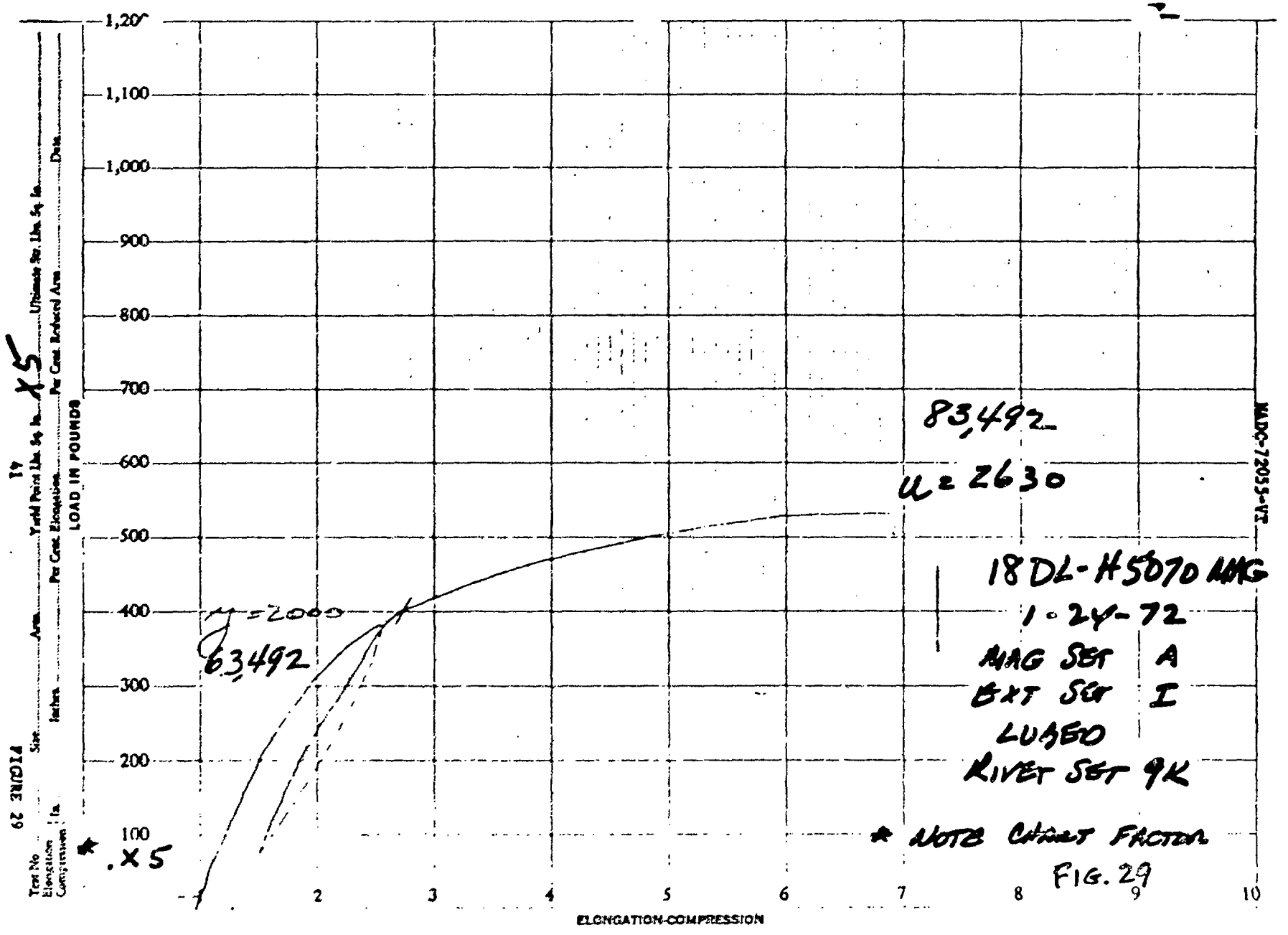


FIGURE 26

NADC-72055-VT


Z
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
Test No. ... Size ... Area ... Yield Point Lbs. Sq. In. ... Ultimate Str. Lbs. Sq. In. ...
Elongation ... Per Cent. Elongation ... Per Cent. Reduced Area ... Date ...
Compression ... In. ... Inches ...
FIGURE 27
39
E = 2850
90,476
E = 2050
65,079
11 D H 5070 MAG
1-20-72
MAG SET A.
EXT SET 2
UNLUBED
RIVET SET 9K
FIG. 27


Z
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
83809
U=2640
Y=1900
60317
15 DL-H9070 MAG
1-24-72
MAG SET = A
EXT SET = I
LU350
RIVET SET 9K
FIG. 28
MADC-72055-VT
FIGURE 28
Test No.
Elongation / Compression
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Inches
Per Cent. Elongation
Per Cent. Reduced Area
Date


1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No
Elongation
Compression
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Inches
Per Cent Elongation
Per Cent Reduced Area
Date
FIGURE 29
MADC-72055-ST
X5
.X5
y=2000
63,492
83,492
u=2630
18DL-H5070 MAG
1-24-72
MAG SET A
EXT SET I
LUA60
RIVET SET 9K
* NOTE CORRECT FACTOR
FIG. 29

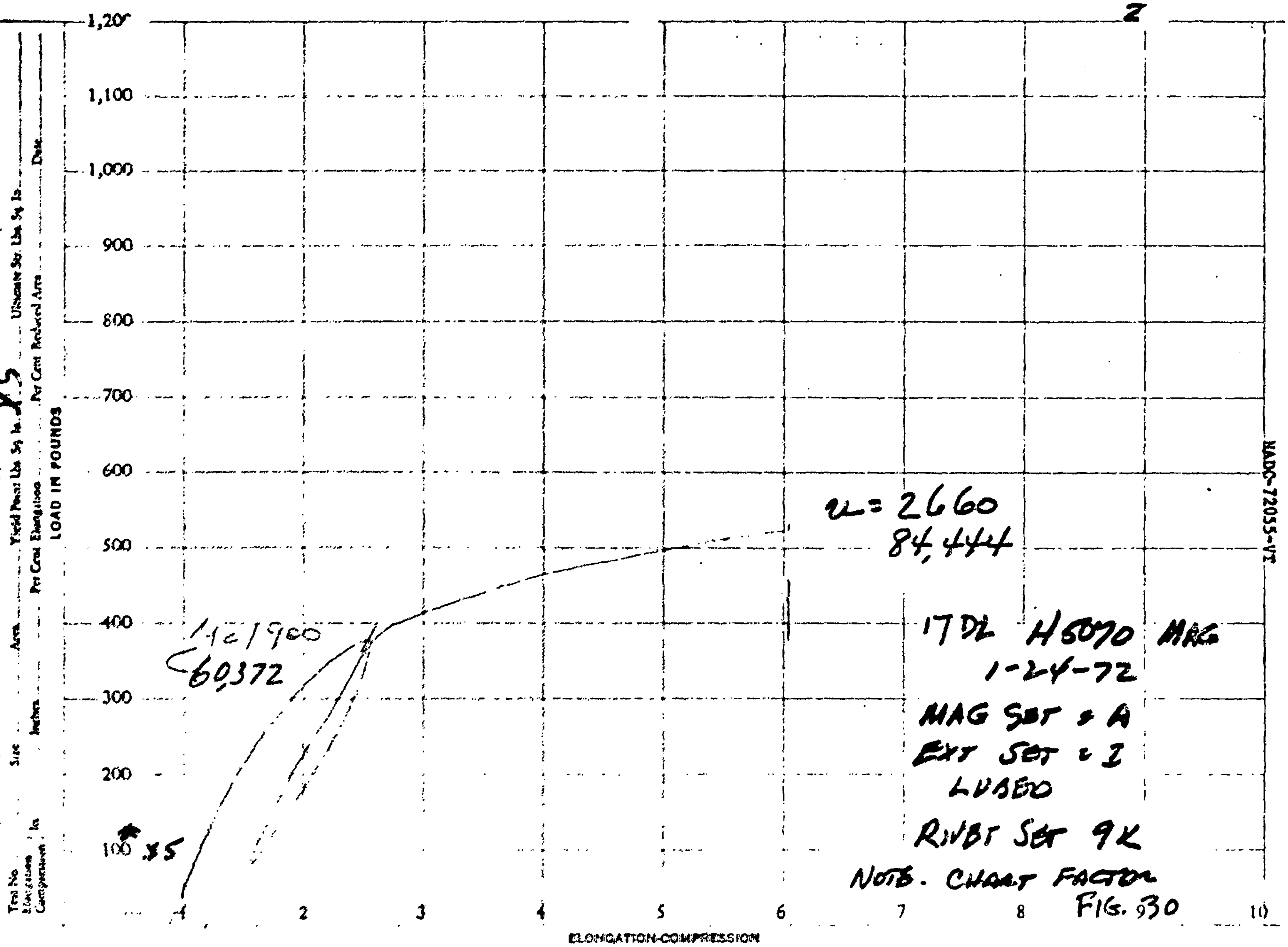

1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
LOAD IN POUNDS
1
2
3
4
5
6
7
8
10
ELONGATION-COMPRESSION
Test No
Elongation, In
Compression
Size
Inches
Area
Yield Point Lbs Sq In.
Per Cent Elongation
Ultimate Str. Lbs Sq In.
Per Cent Reduced Area
Date
X5
X5
Z
1/2 1900
C60372
u = 2660
84,444
17DL H5070 MAG
1-24-72
MAG SET = A
EXT SET = I
LUBED
RIVET SET 9K
NOTE. CHART FACTOR
FIG. 930

FIGURE 30

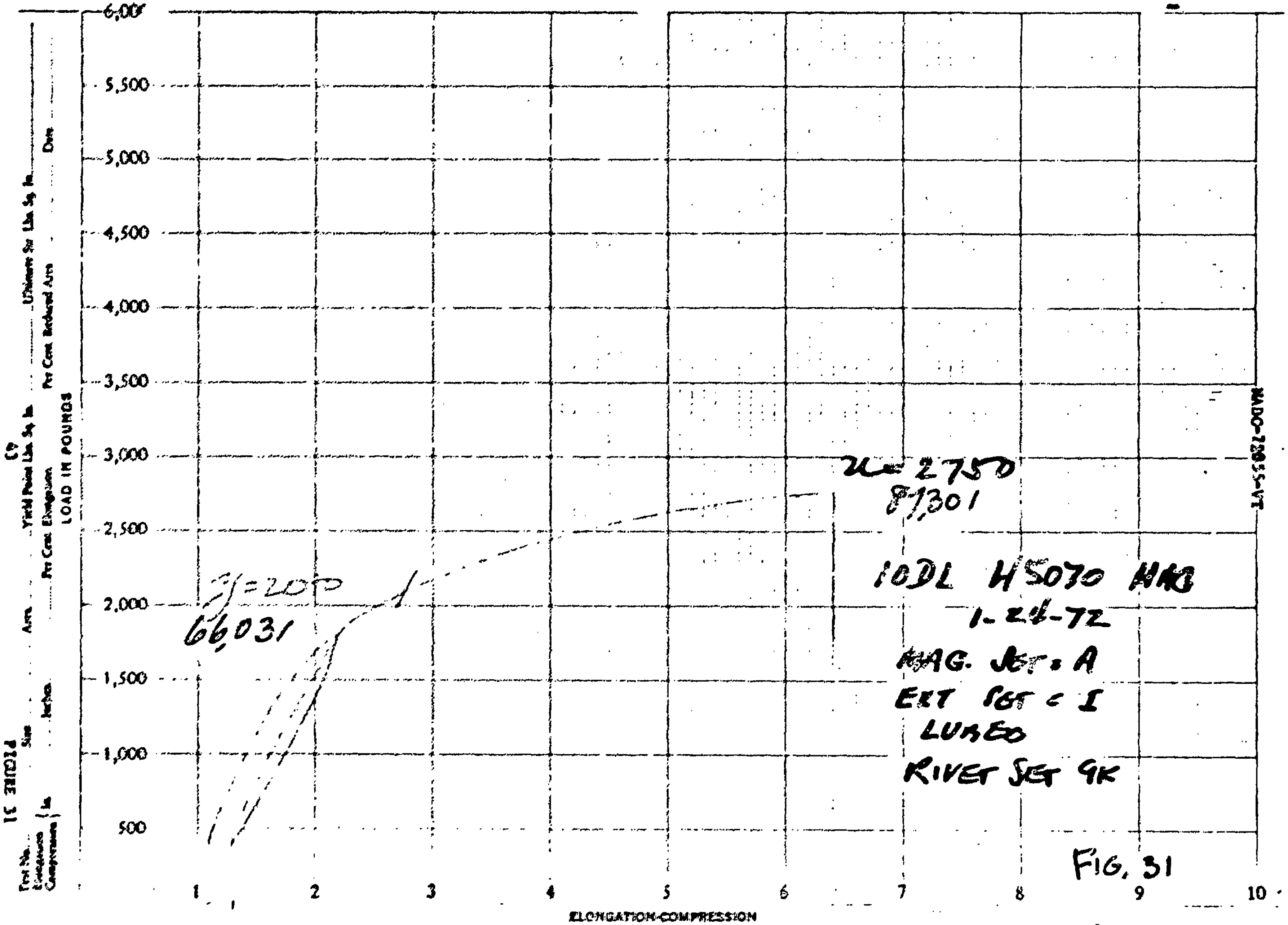

Test No.
Elongation / Compression | In.
Size
Inches
Area
Yield Point Lbs Sq In.
Per Cent Elongation
Ultimate Str Lbs Sq In.
Per Cent Reduced Area
Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
=200
66,031
=2750
87,301
10DL H5070 MKB
1-24-72
MAG. SET = A
EXT SET = I
LUBED
RIVET SET 9K
FIG. 31

FIGURE 31

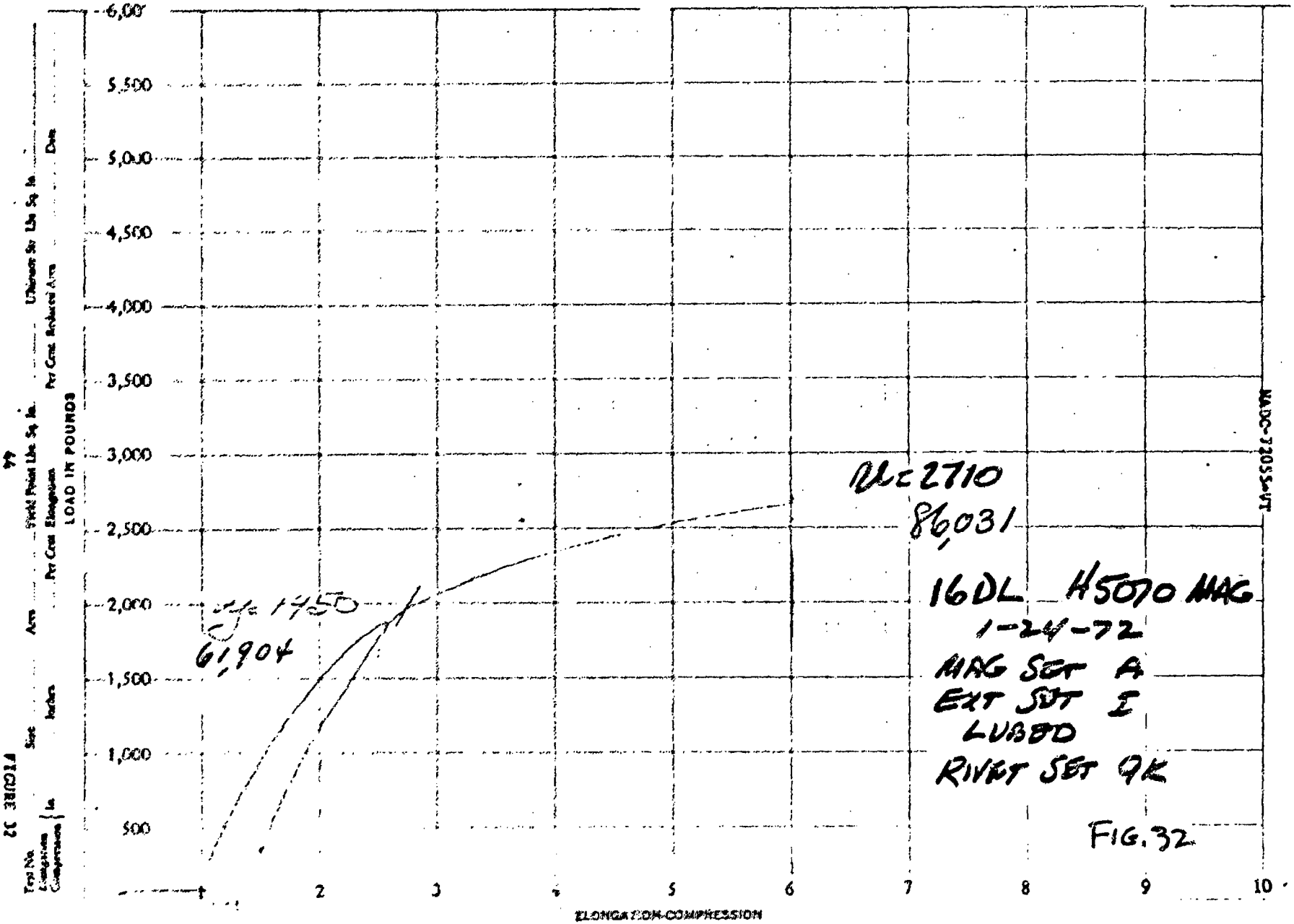
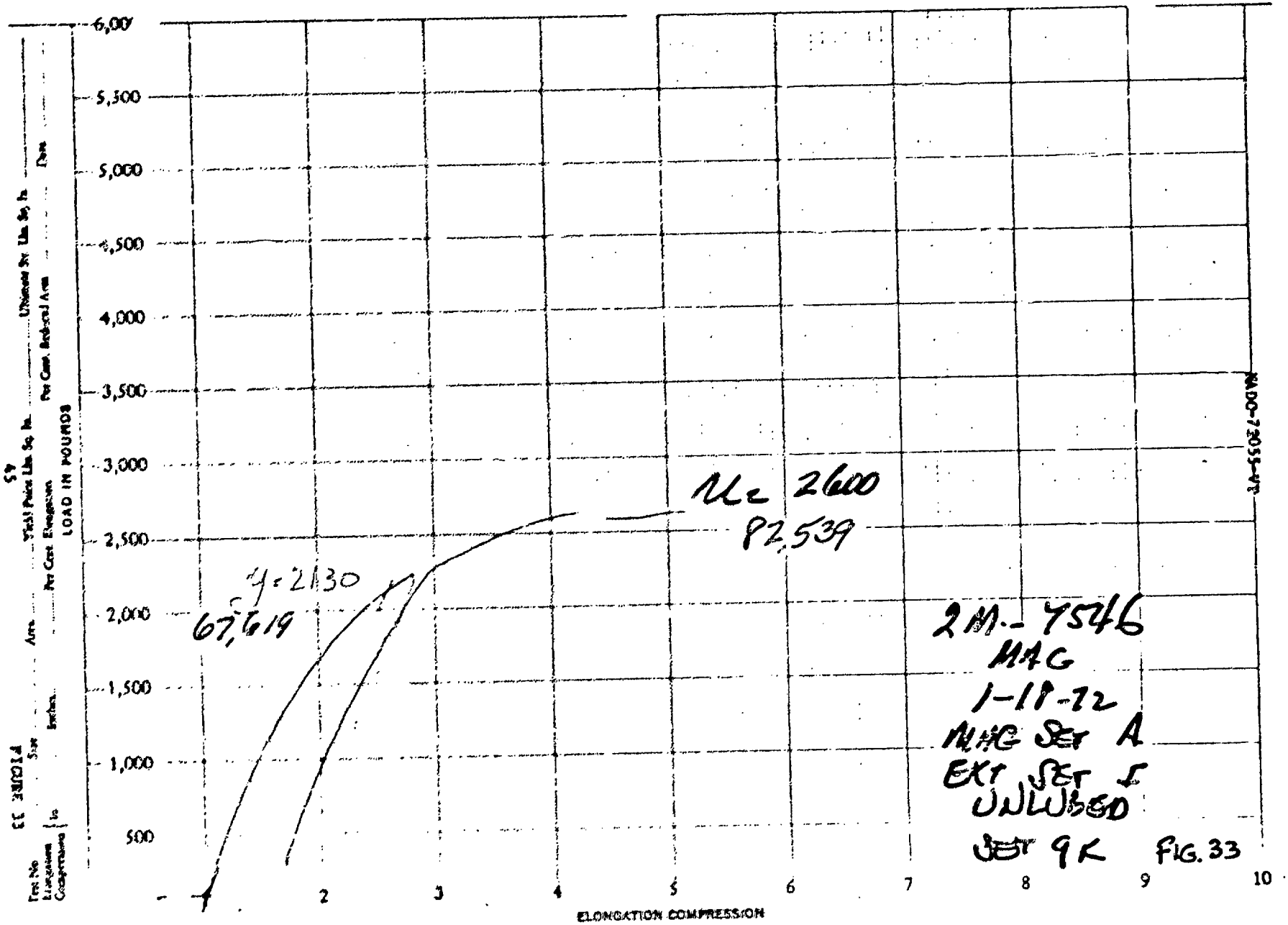

LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
MADC-7205-VT
Uc 2710
86,031
16DL H5070 MAG
1-24-72
MAG SET A
EXT SET E
LUBED
RIVET SET 9K
FIG. 32
Cy 1450
61,904

FIGURE 32


6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION COMPRESSION
Uc 2600
92,539
y=2130
67,619
2M-7546
MAG
1-18-72
MAG SET A
EXT SET F
UNLUBED
SET 9K
FIG. 33

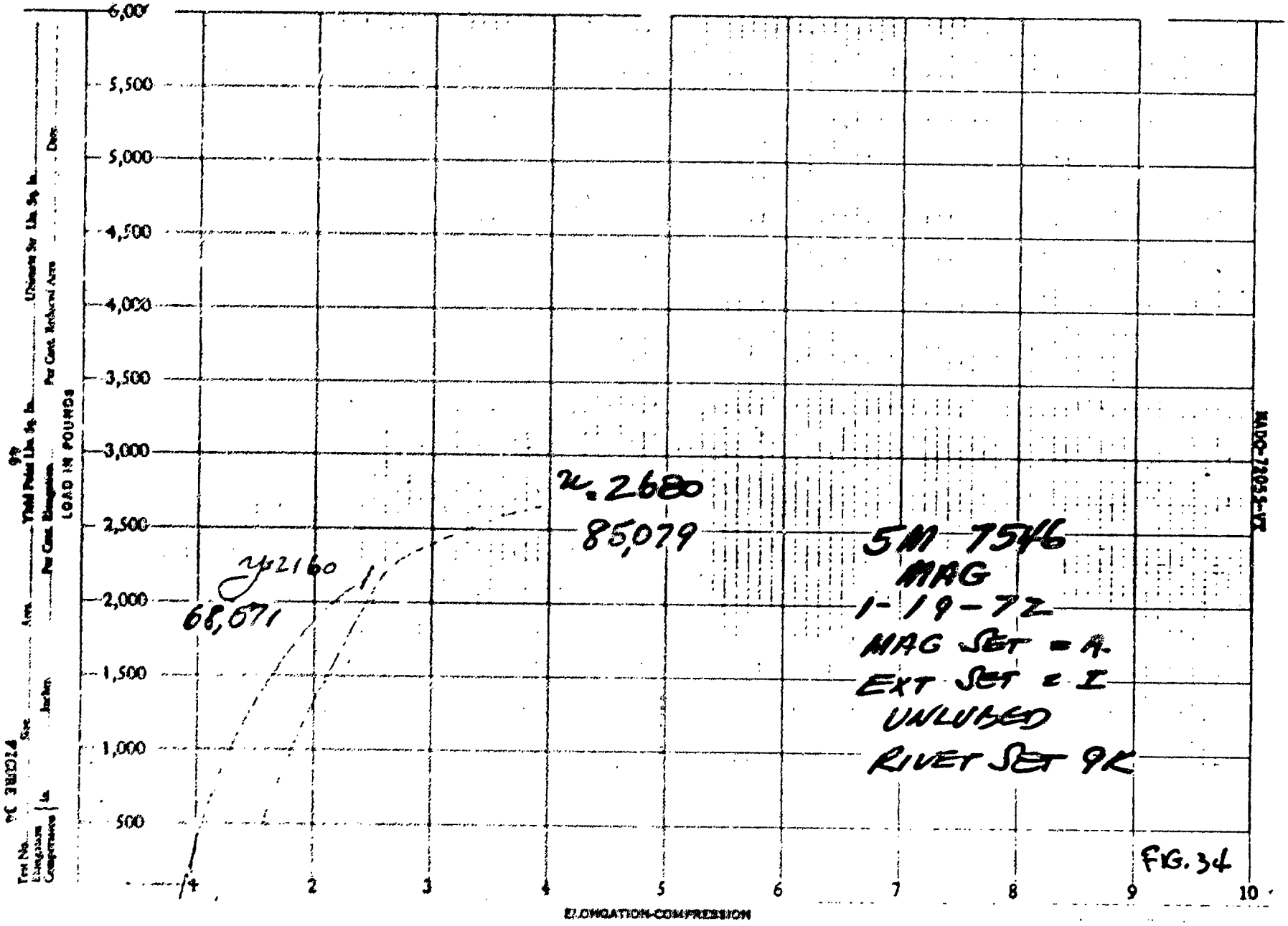

6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
y=2680
85,079
y=2160
68,671
5M 7546
MAG
1-19-72
MAG SET = 4
EXT SET = 1
UNLUBED
RIVET SET 9K

FIG. 34

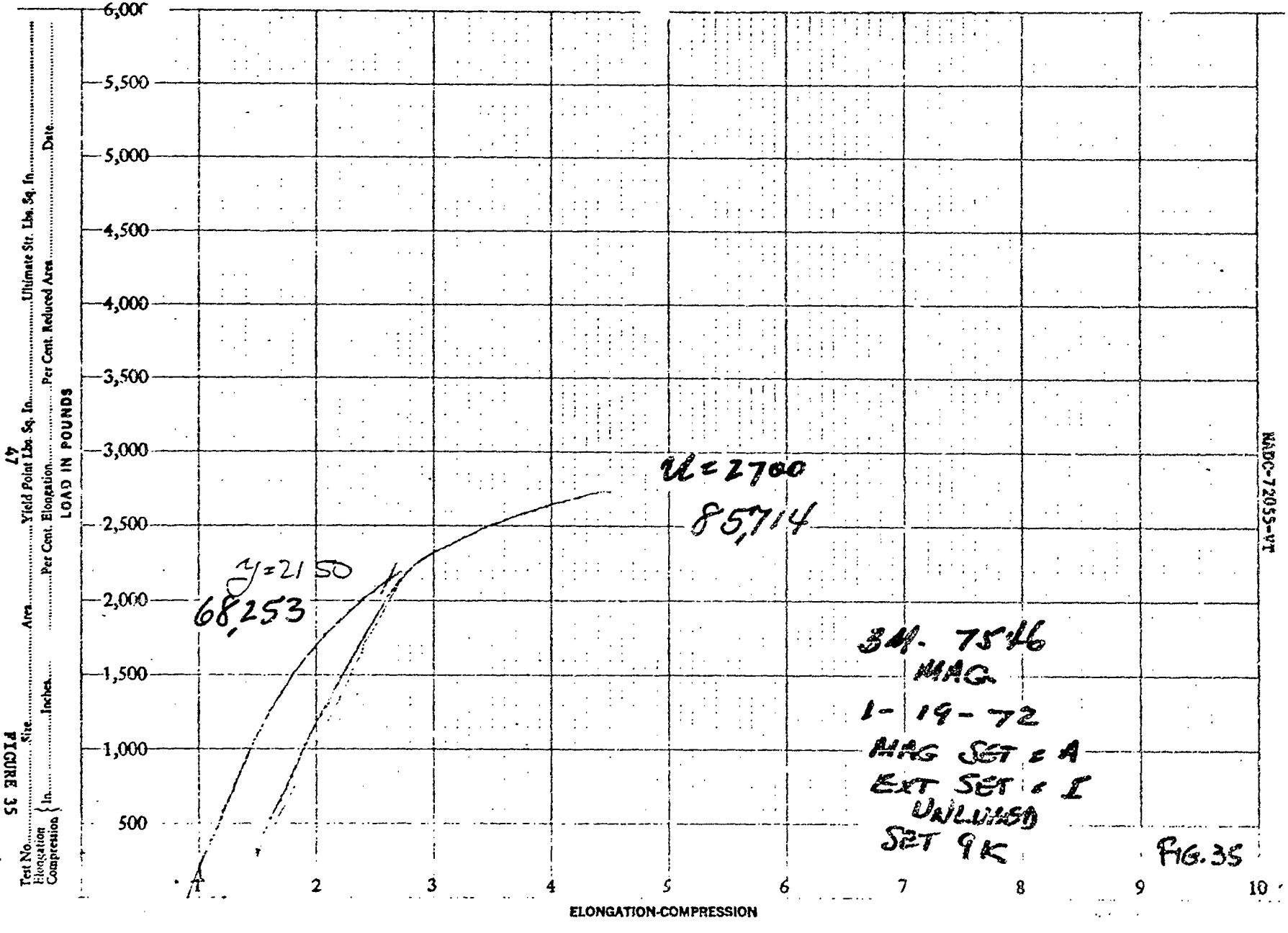
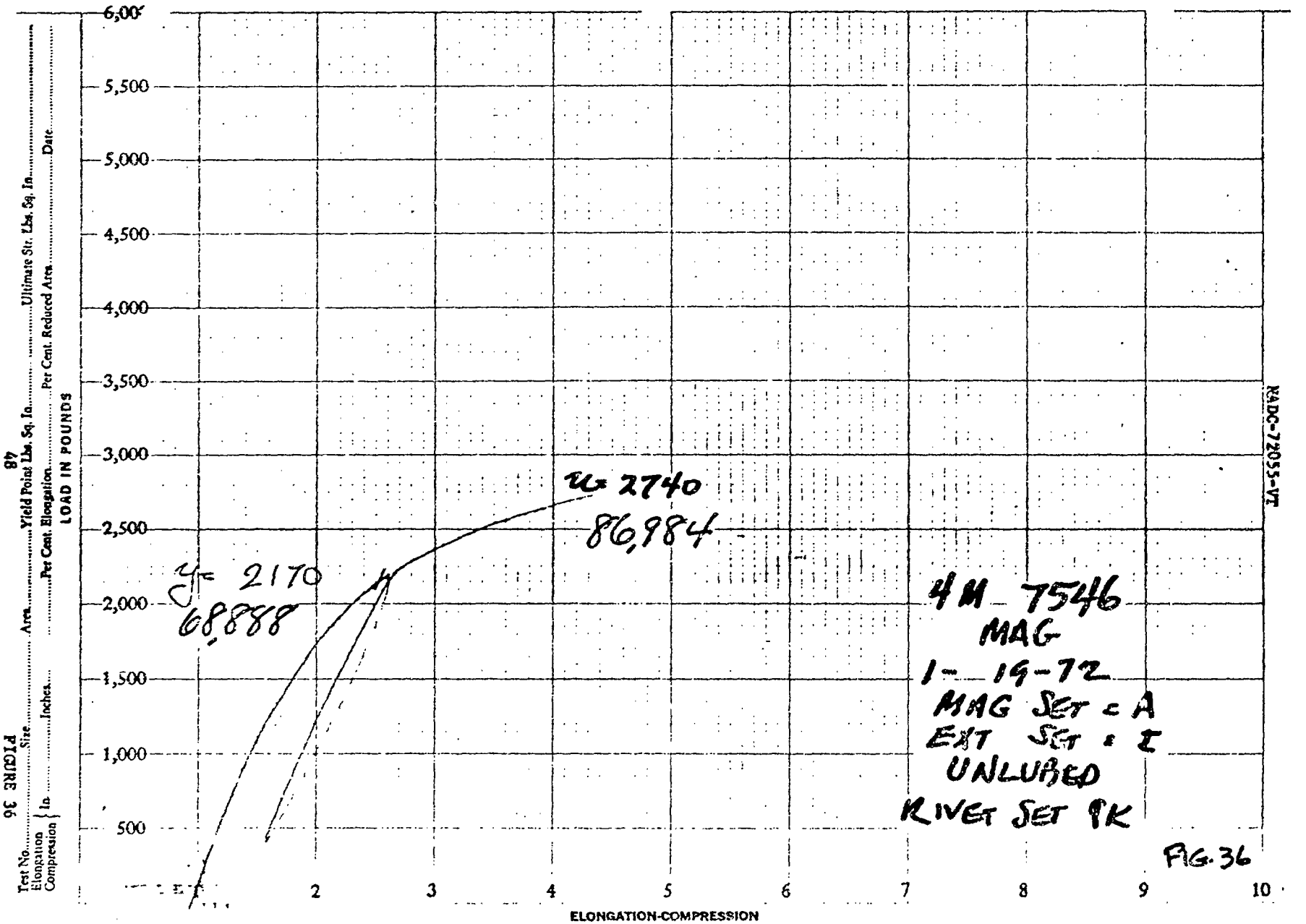


FIGURE 35
47
Test No. Size. Area. Yield Point Lbs. Sq. In. Ultimate Str. Lbs. Sq. In.
Elongation In. Per Cent. Elongation Per Cent. Reduced Area
Compression Inches. Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
U=2700
85,714
Y=2150
68,253
34.7546
MAG.
1-19-72
MAG SET = A
EXT SET = I
UNLUBED
SET 9K
FIG. 35
NADC-72055-VT


Test No.
Elongation
Compression } In.
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Per Cent. Elongation
Per Cent. Reduced Area
Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
y= 2740
86,984
y= 2170
68,888
4M 7546
MAG
1-19-72
MAG SET = A
EXT SET = I
UNLUBED
RIVET SET 9K
FIG. 36
NADC-72055-VT

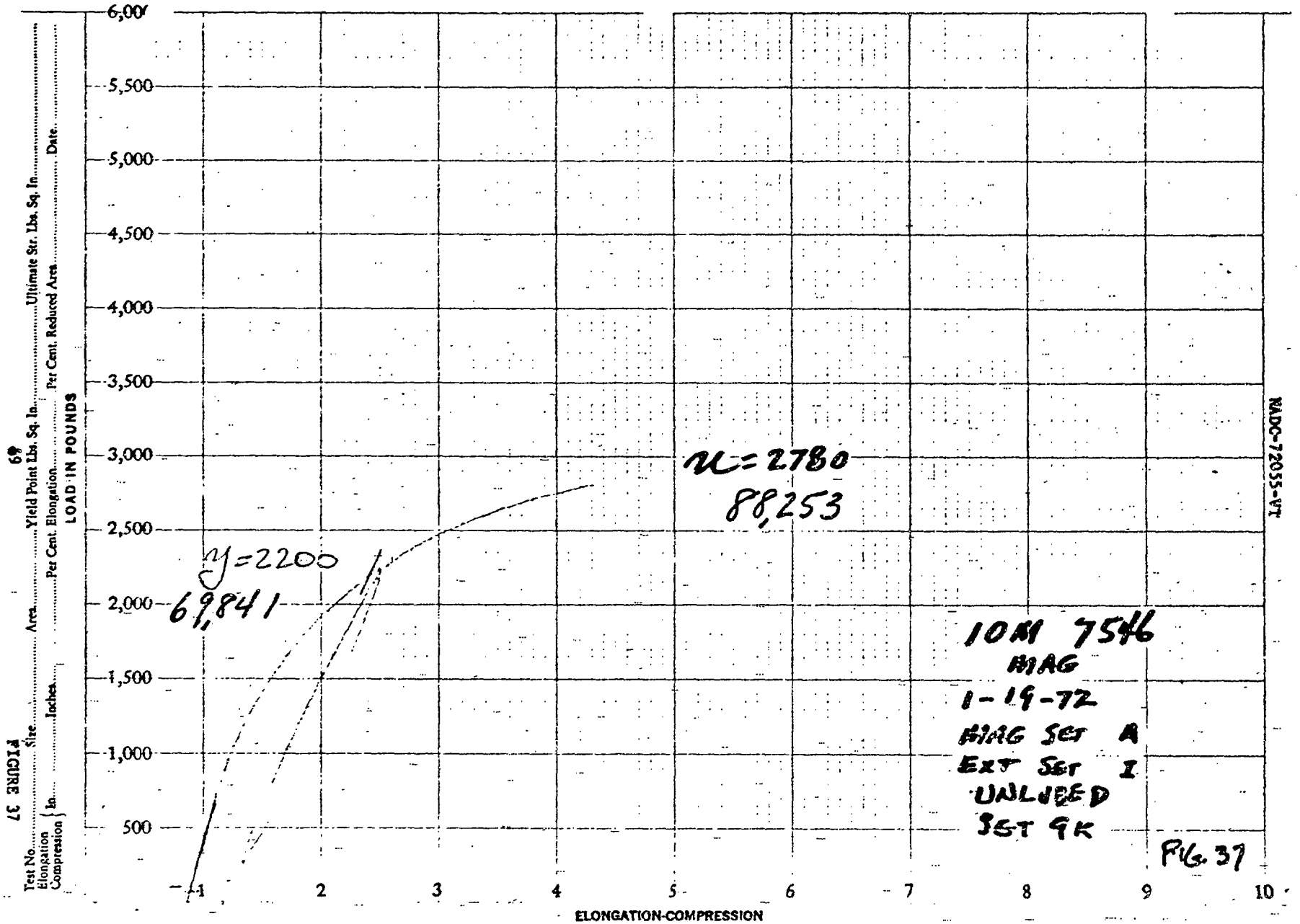


FIGURE 37
Test No. 69
Elongation / Compression } In.
Size
Area
Yield Point Lbs. Sq. In.
Per Cent. Elongation
Ultimate Str. Lbs. Sq. In.
Per Cent. Reduced Area
Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
u=2780
88,253
y=2200
69,841
10M 7546
MAG
1-19-72
MAG SET A
EXT SET I
UNLOAD
SET 9K
FIG. 37

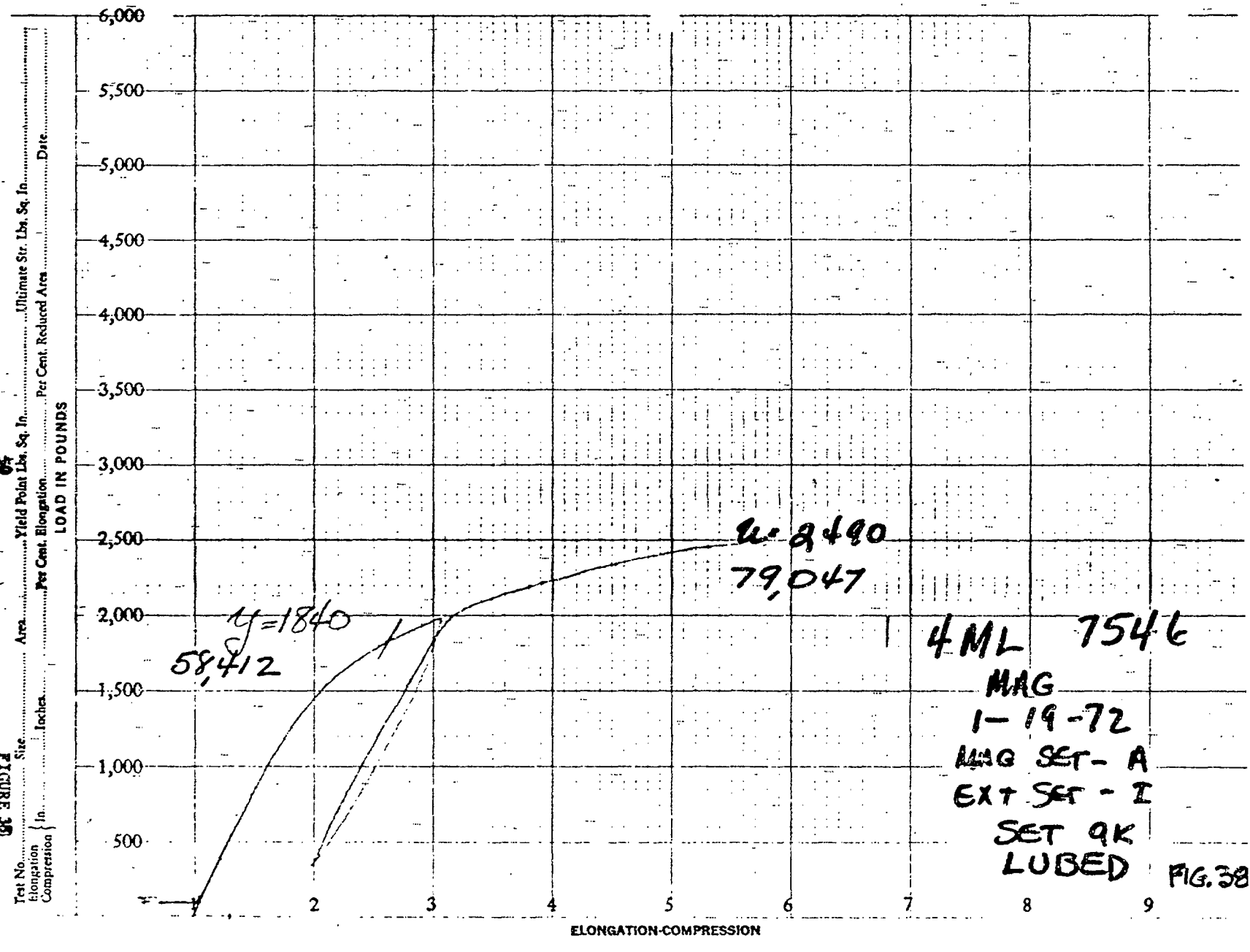


FIGURE 38
Test No. ..... Size ..... Area ..... Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. ..... Date .....
Elongation } In. ..... Inches ..... Per Cent. Elongation ..... Per Cent. Reduced Area .....
Compression }
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
ELONGATION-COMPRESSION
4 ML 7546
MAG
1-19-72
MAG SET - A
EXT SET - I
SET 9K
LUBED
FIG. 38

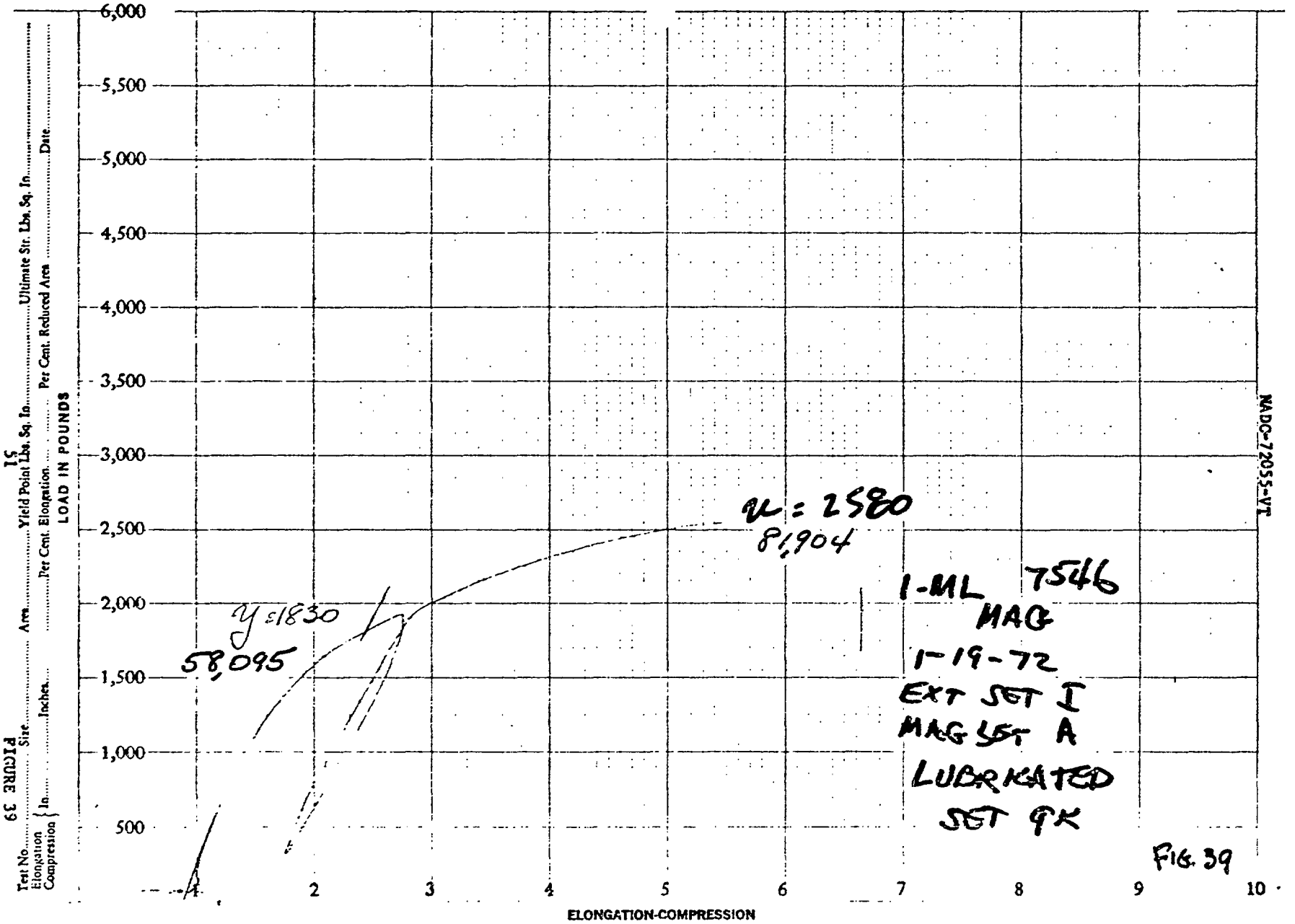


FIGURE 39

Fig. 39

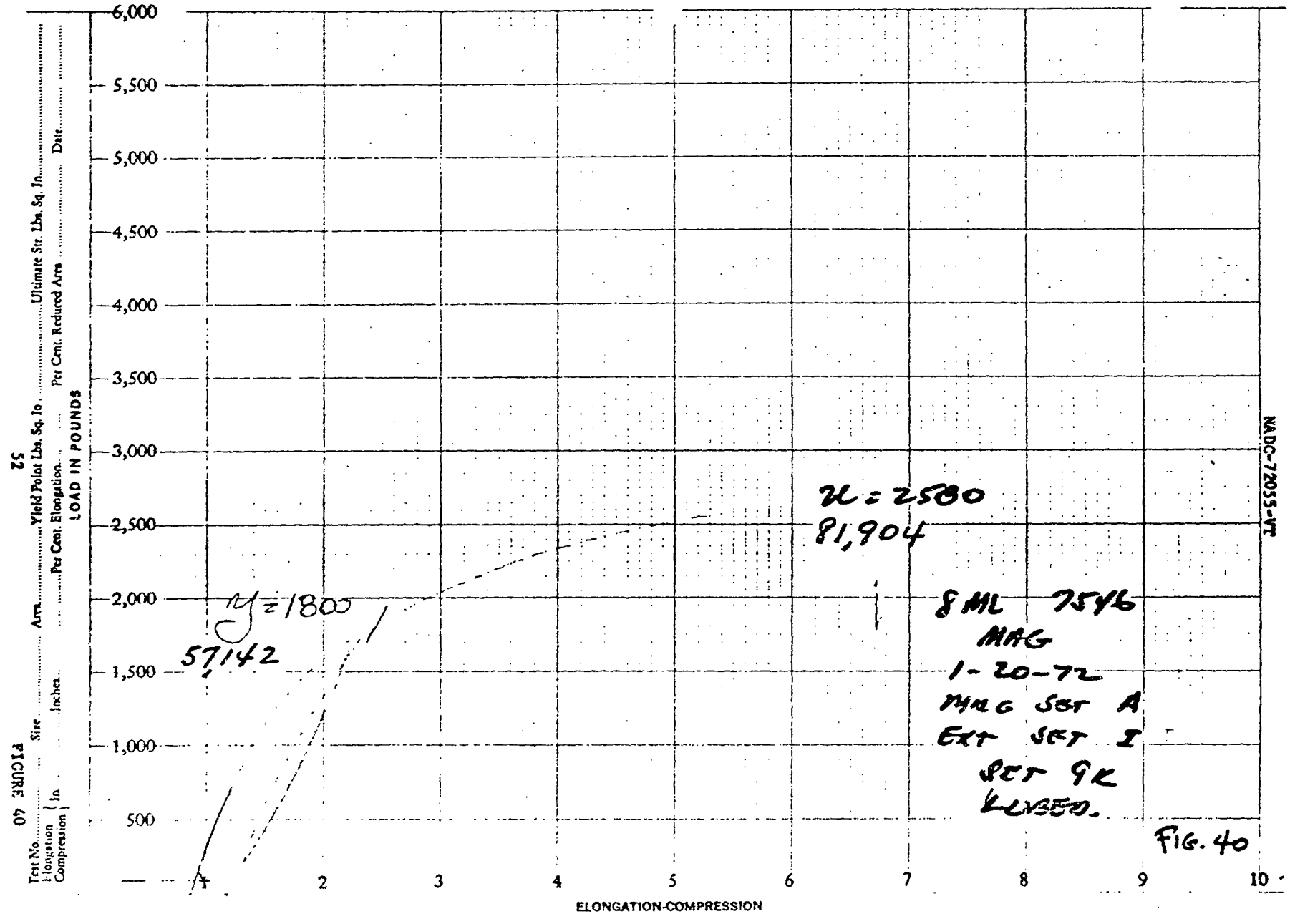


FIGURE 40
Test No. ..... Size ..... Area ..... Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. .....
Elongation (In. ..... Inches ..... Per Cent. Elongation ..... Per Cent. Reduced Area ..... Date .....
Compression)
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
M = 1800
57,142
M = 2580
81,904
8 ML 75%6
MAG
1-20-72
MAG SET A
EXT SET I
SET 9L
KLUGED.
FIG. 40

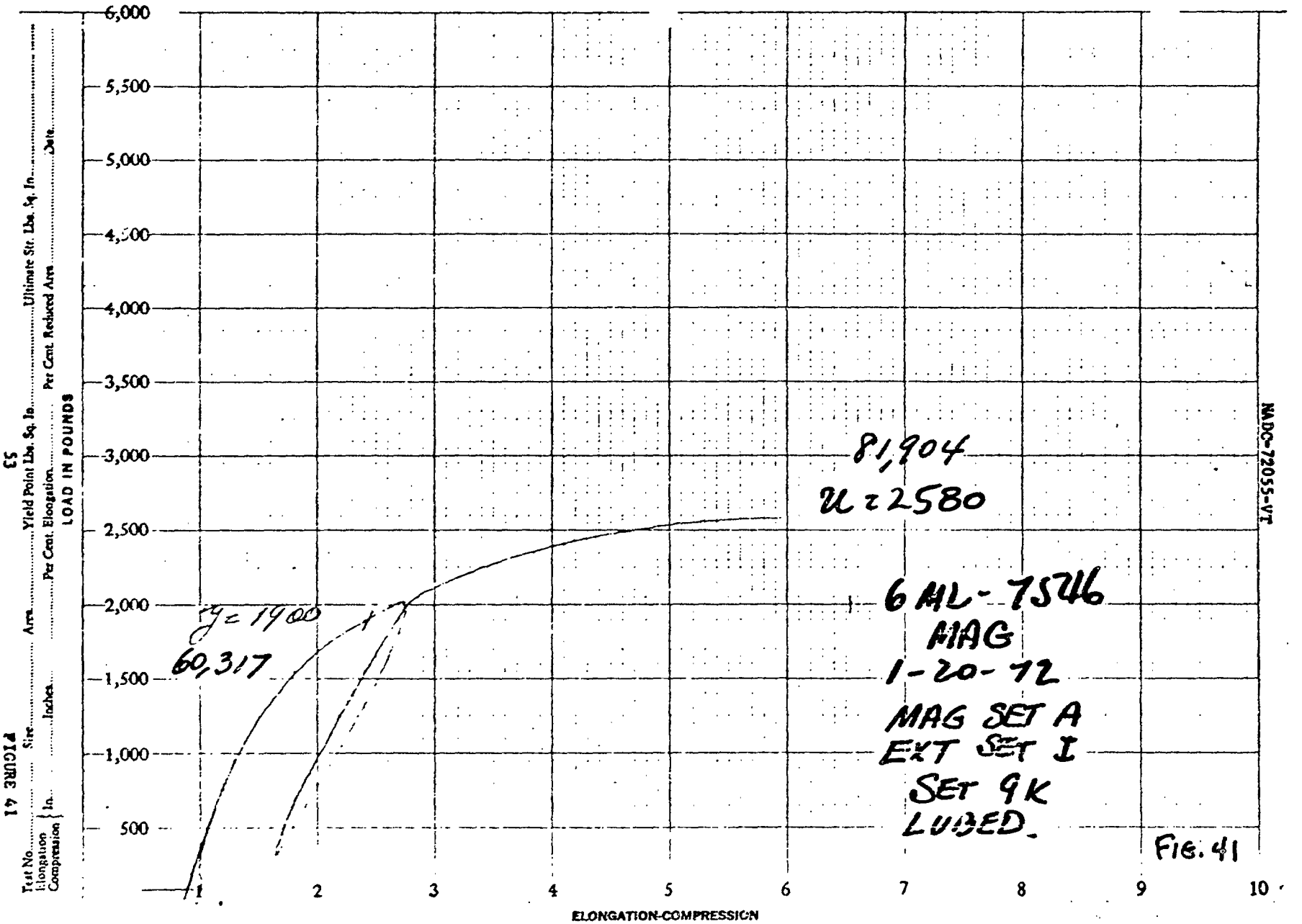


FIGURE 41
Test No. ..... Size ..... Area ..... Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. .....
Elongation { In. ..... Inches ..... Per Cent. Elongation ..... Per Cent. Reduced Area ..... Date .....
Compression
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
81,904
U = 2580
y = 1900
60,317
6 ML-7546
MAG
1-20-72
MAG SET A
EXT SET I
SET 9K
LUBED.
FIG. 41

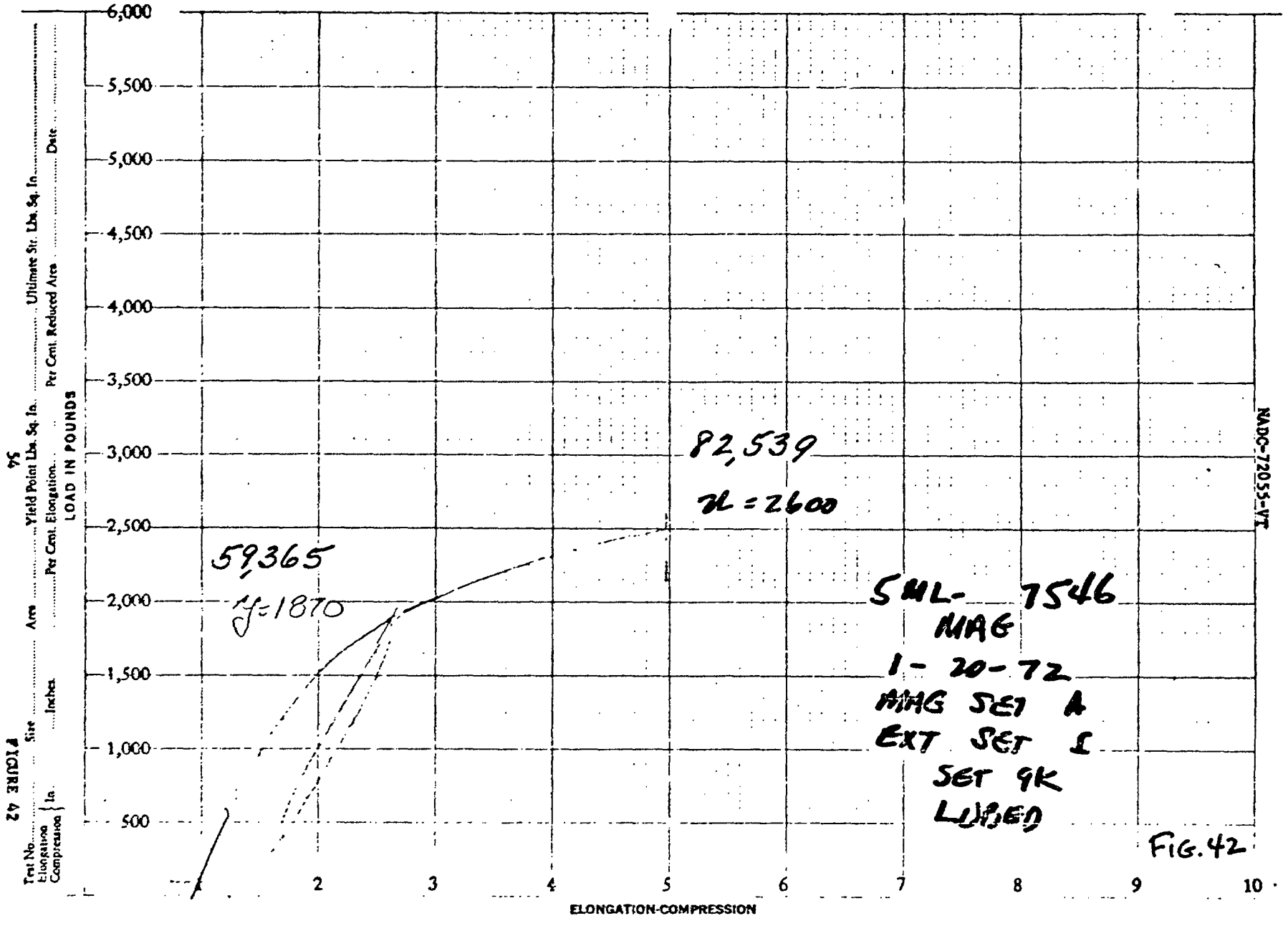
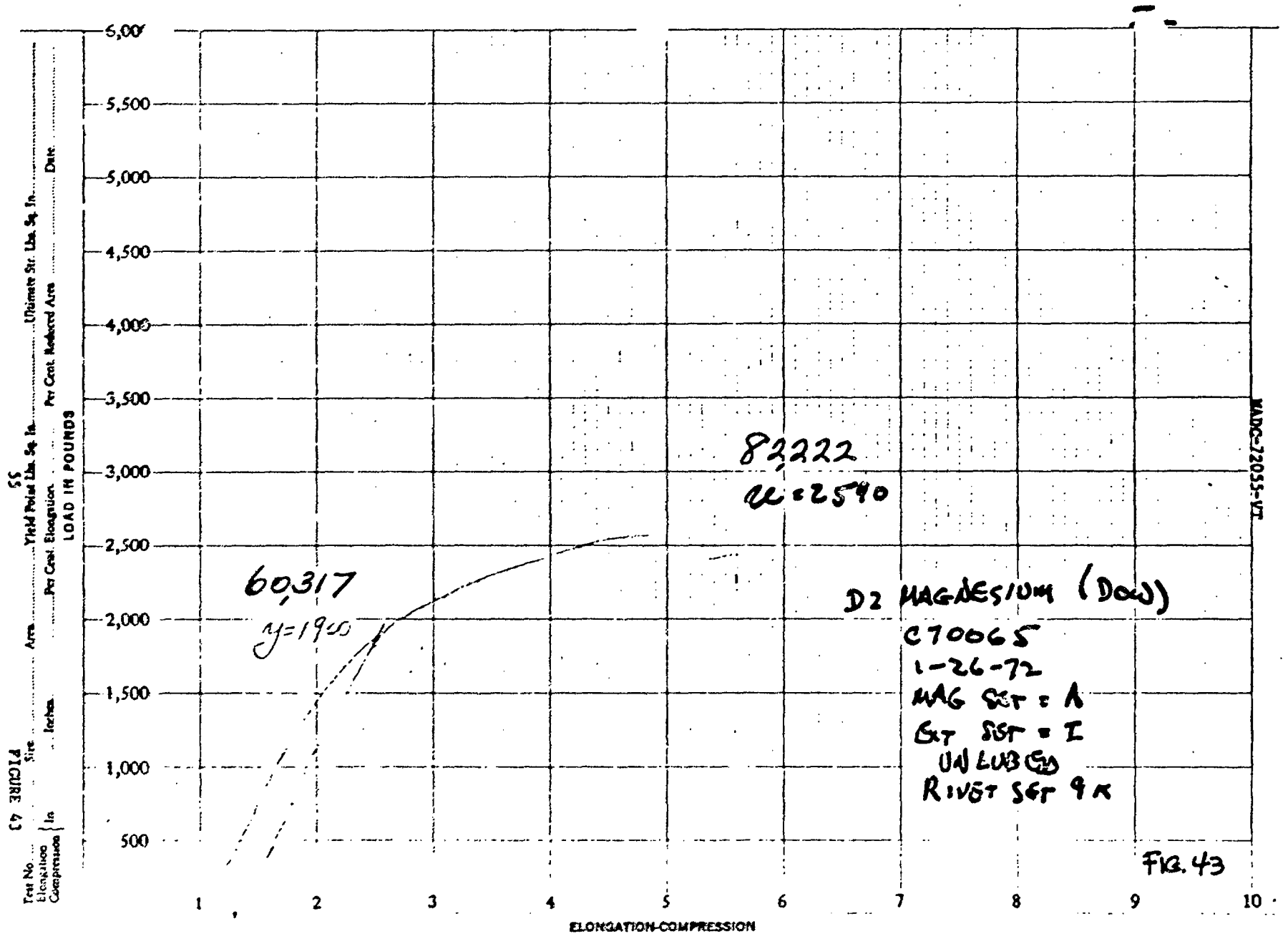
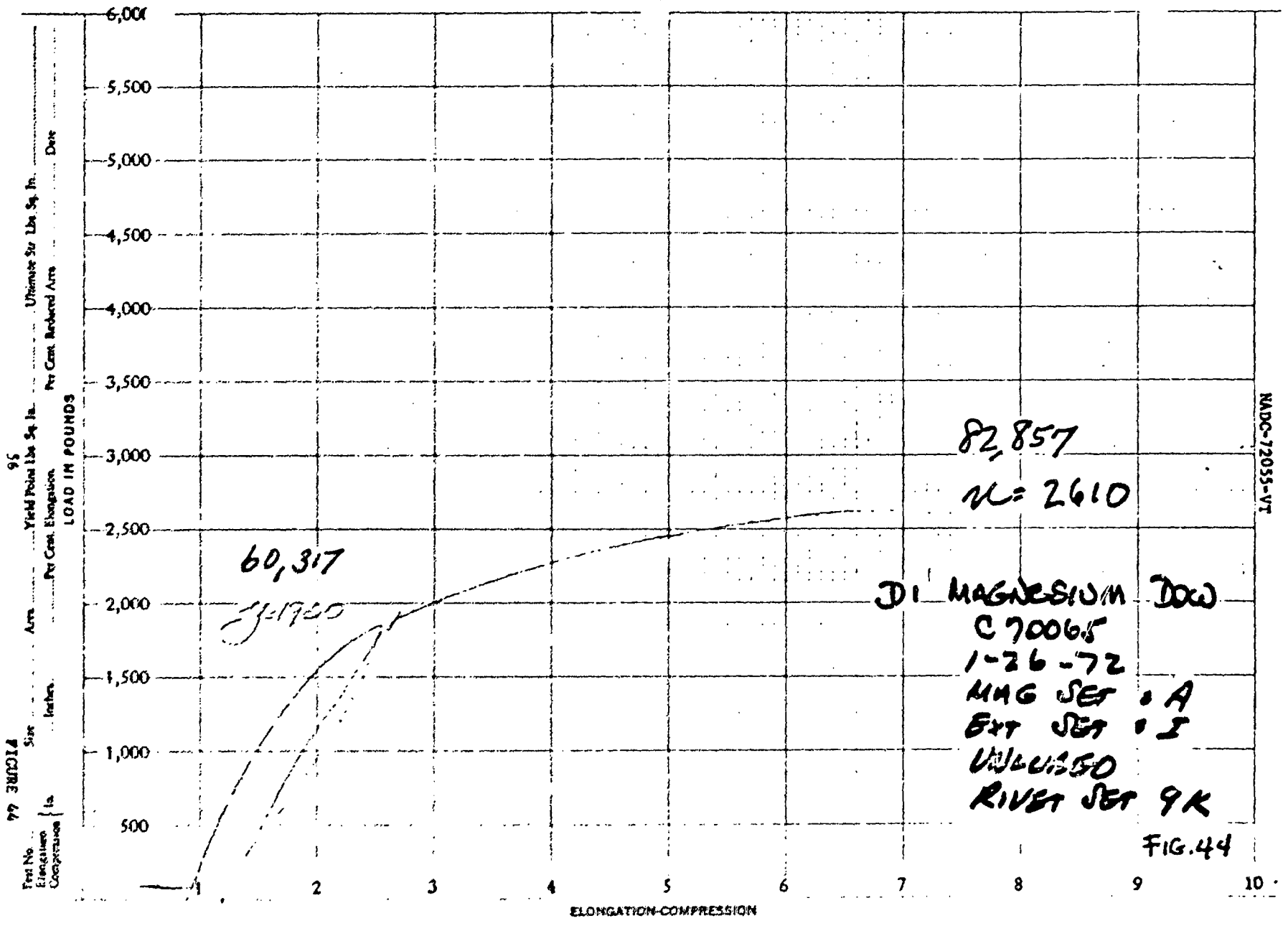
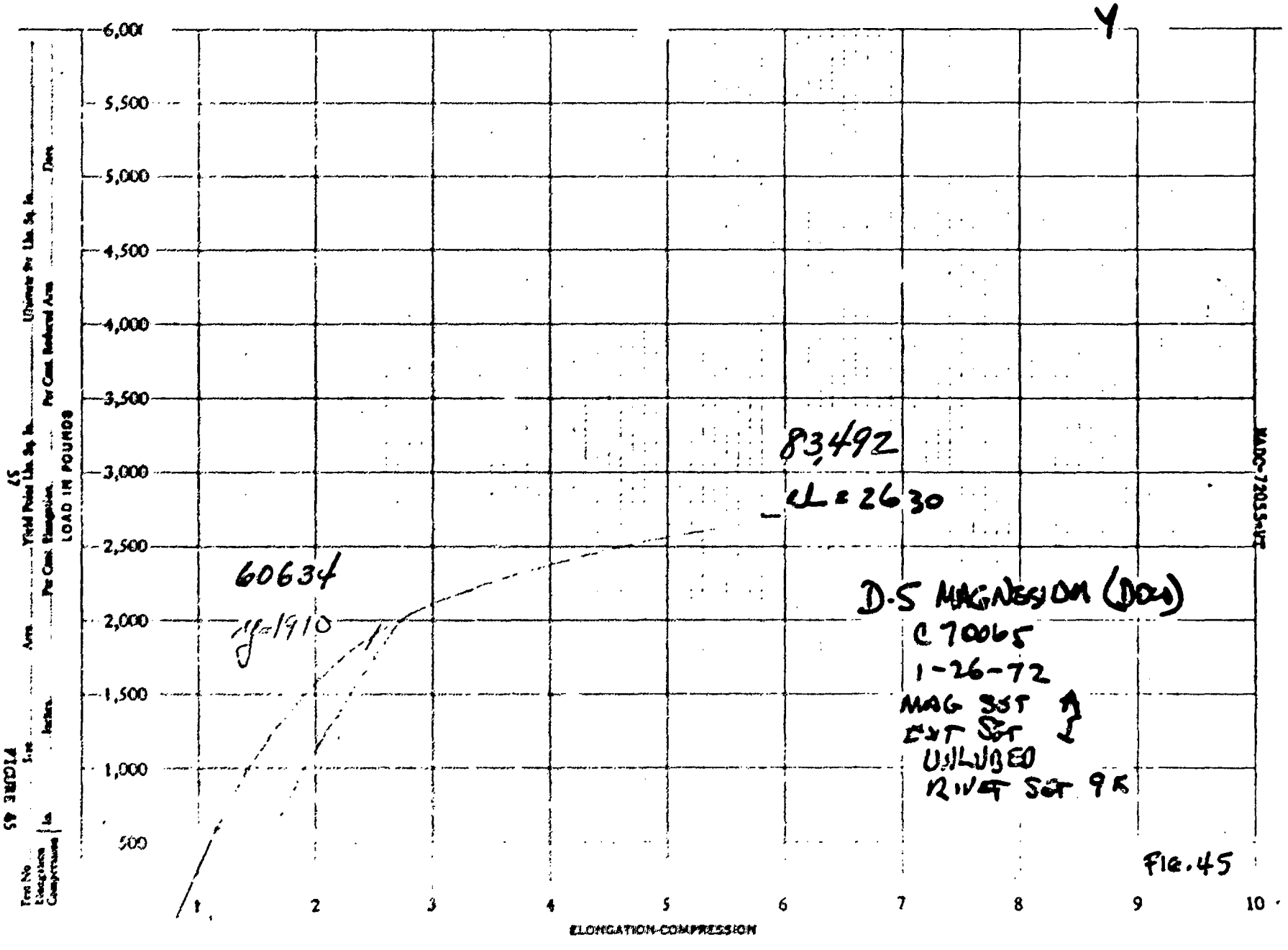


FIGURE 42
Test No. ..... Size .....
Elongation ..... Area .....
Compression ..... In. ..... Inches ..... Per Cent Elongation ..... Per Cent. Reduced Area .....
Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. .....
Date .....
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
82,539
H = 2600
59,365
y = 1870
SML- 7546
MAG
1-20-72
MAG SET A
EXT SET L
SET 9K
LOADED
NADC-72055-VT
FIG. 42


6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
82222
e=2540
60,317
y=1900
D2 MAGNESIUM (DOW)
C70065
1-26-72
MAG SET = A
GT SET = I
UNLUB
RIVET SET 9K
FIG. 43
MADC-72055-VT
FIGURE 43
55
Test No.
Elongation
Compression
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
In
Inches
Per Cent. Elongation
Per Cent. Reduced Area
Date


6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Per Cent. Elongation
Per Cent. Reduced Area
Date
Size
Area
Inches
Test No.
Elevation
Temperature
FIGURE 44
82,857
E = 2610
60,317
DI MAGNESIUM DOW
C70065
1-26-72
MAG SET : A
EXT SET : I
UNLUBE 50
RIVET SET 9K
FIG. 44
NADC-72055-VT


Y
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
83492
EL = 2630
60634
ty = 1910
D-5 MAGNESIUM (DOW)
C70065
1-26-72
MAG SET
EXT SET
UNLUBED
RIVET SET 95
MADC-7205-5-72
FIGURE 45
Fig. 45

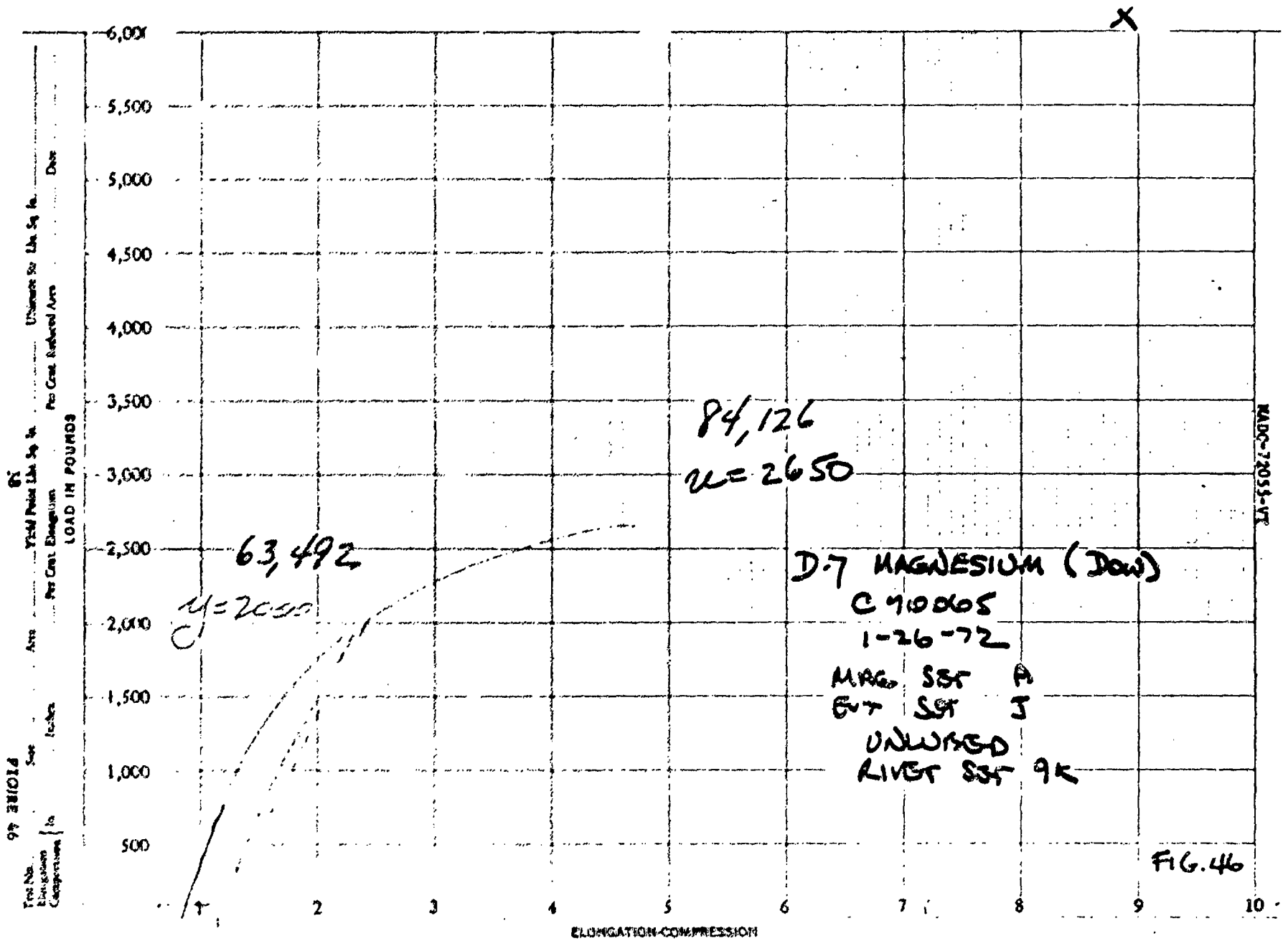
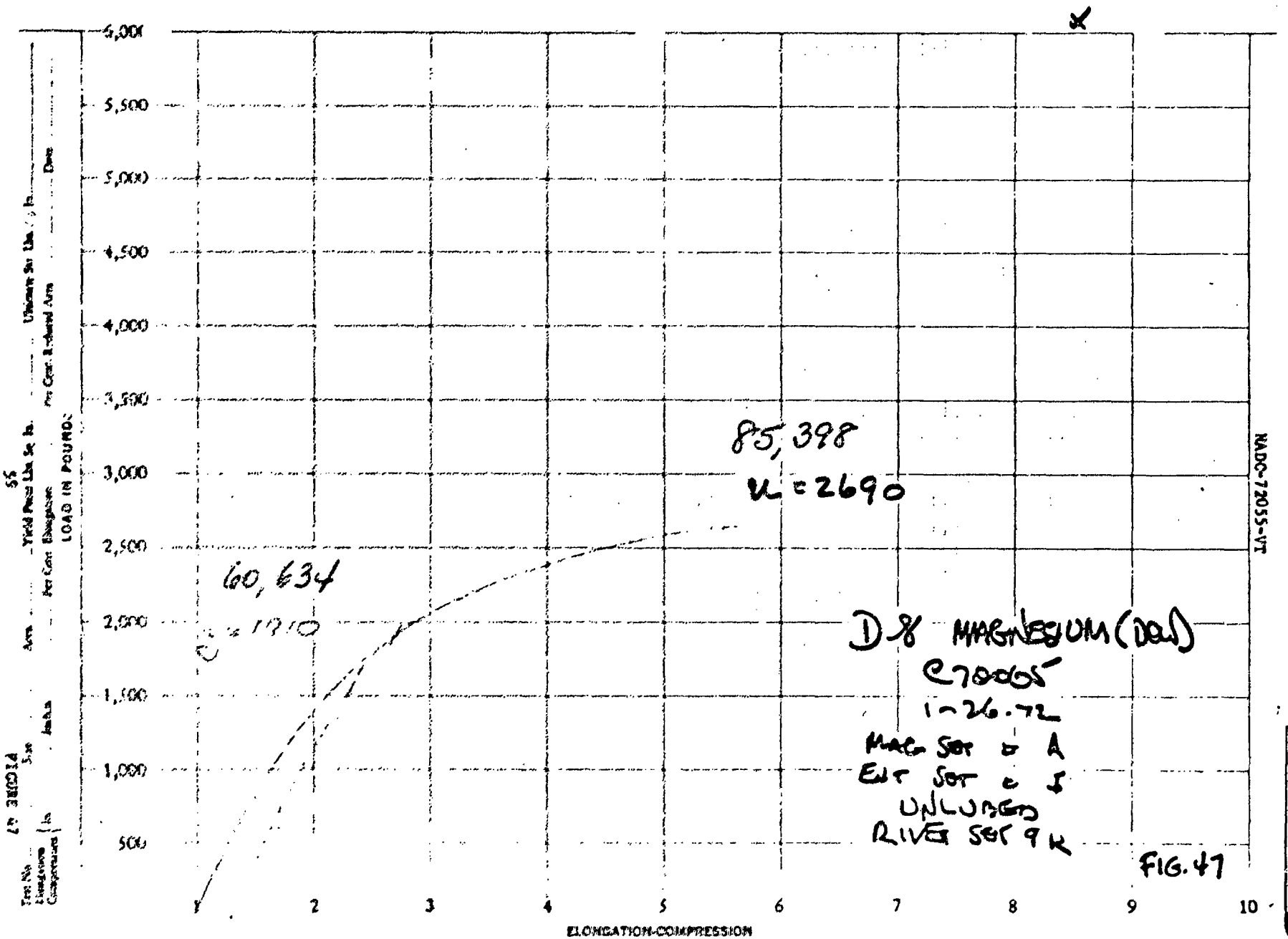
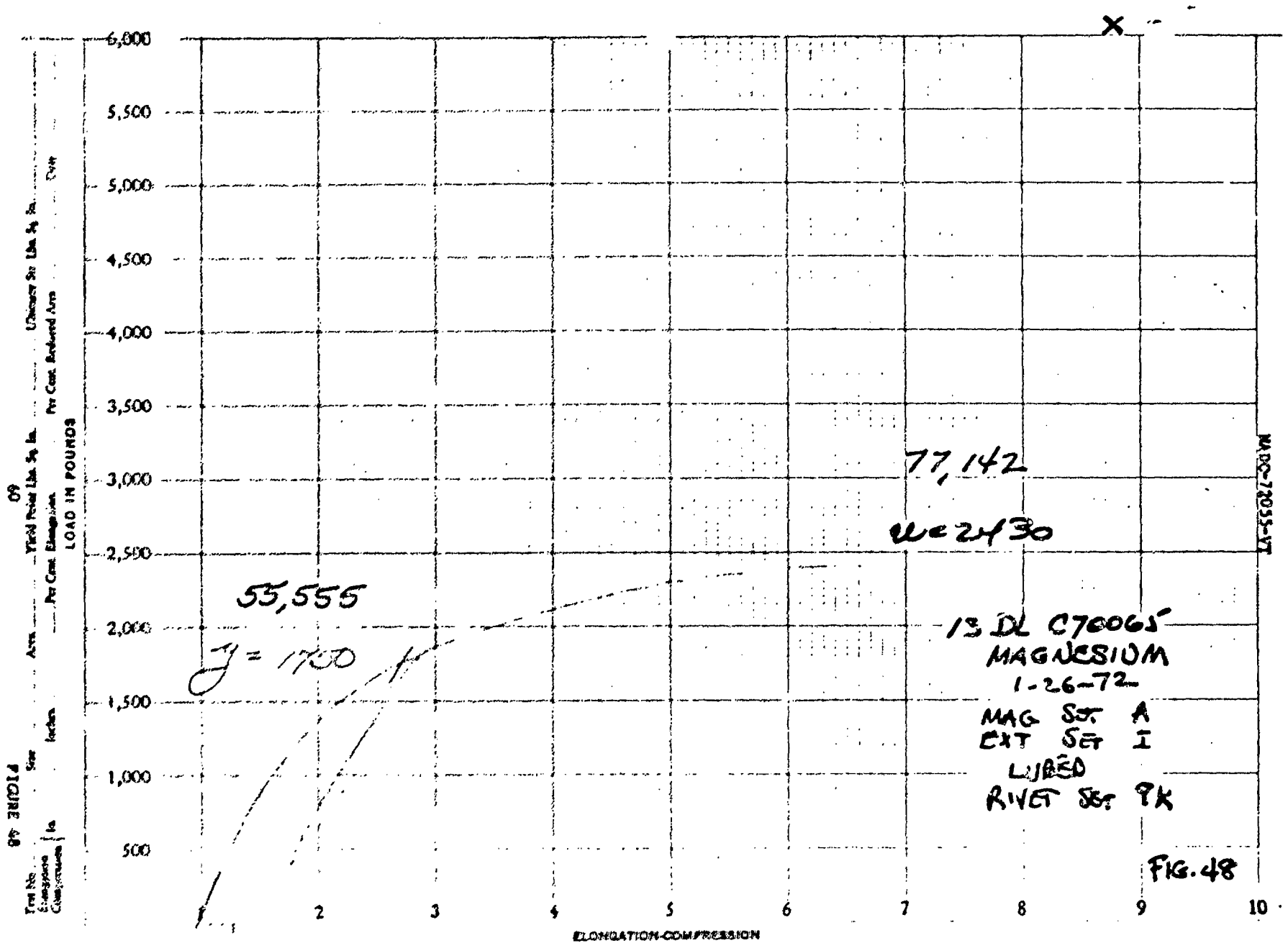
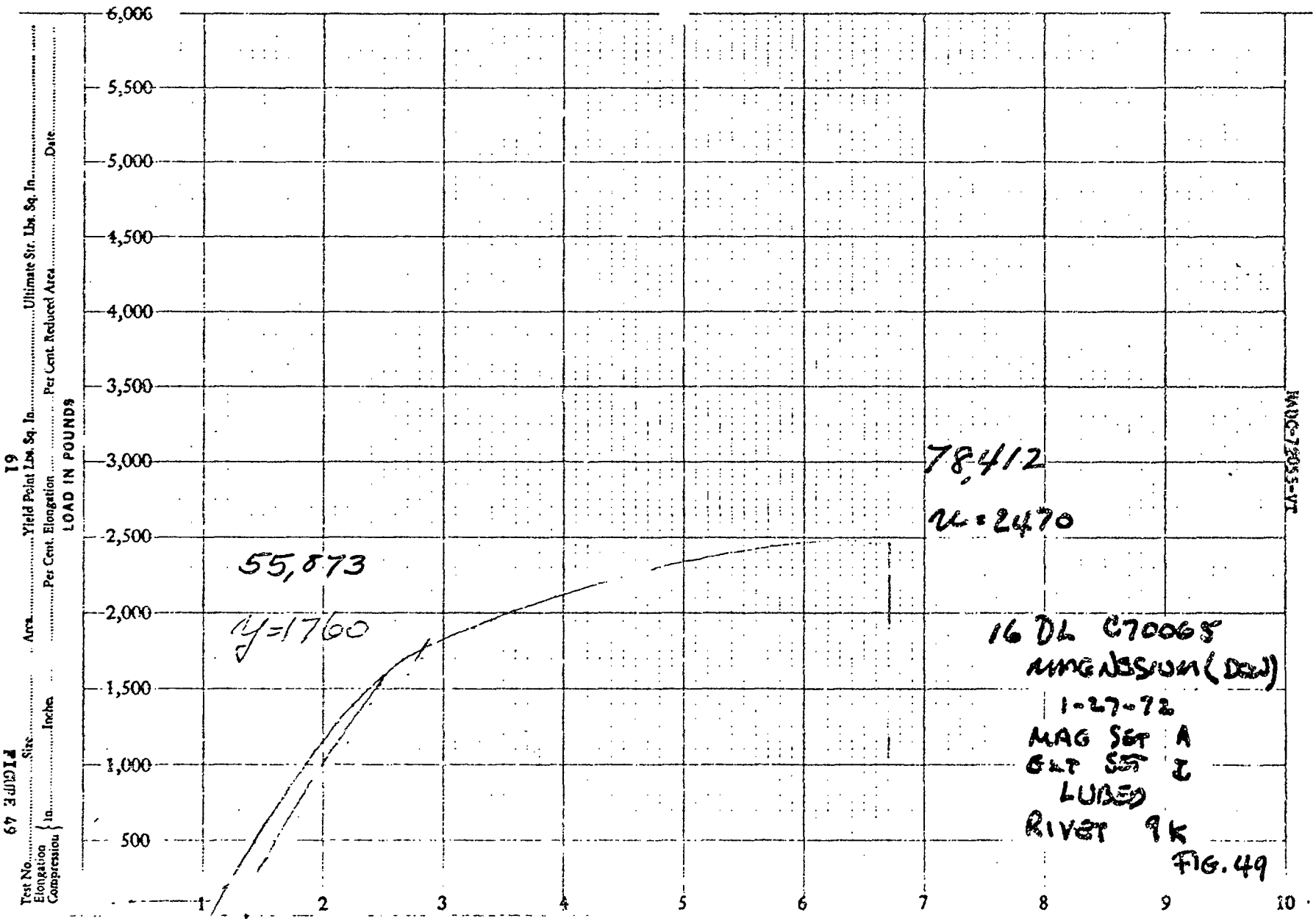

6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
84,126
E=2650
63,492
E=2000
D-7 MAGNESIUM (DOW)
C 910005
1-26-72
MAG SST A
EXT SST J
UNLINED
RIVET SST 9K
MADC-72054-ST

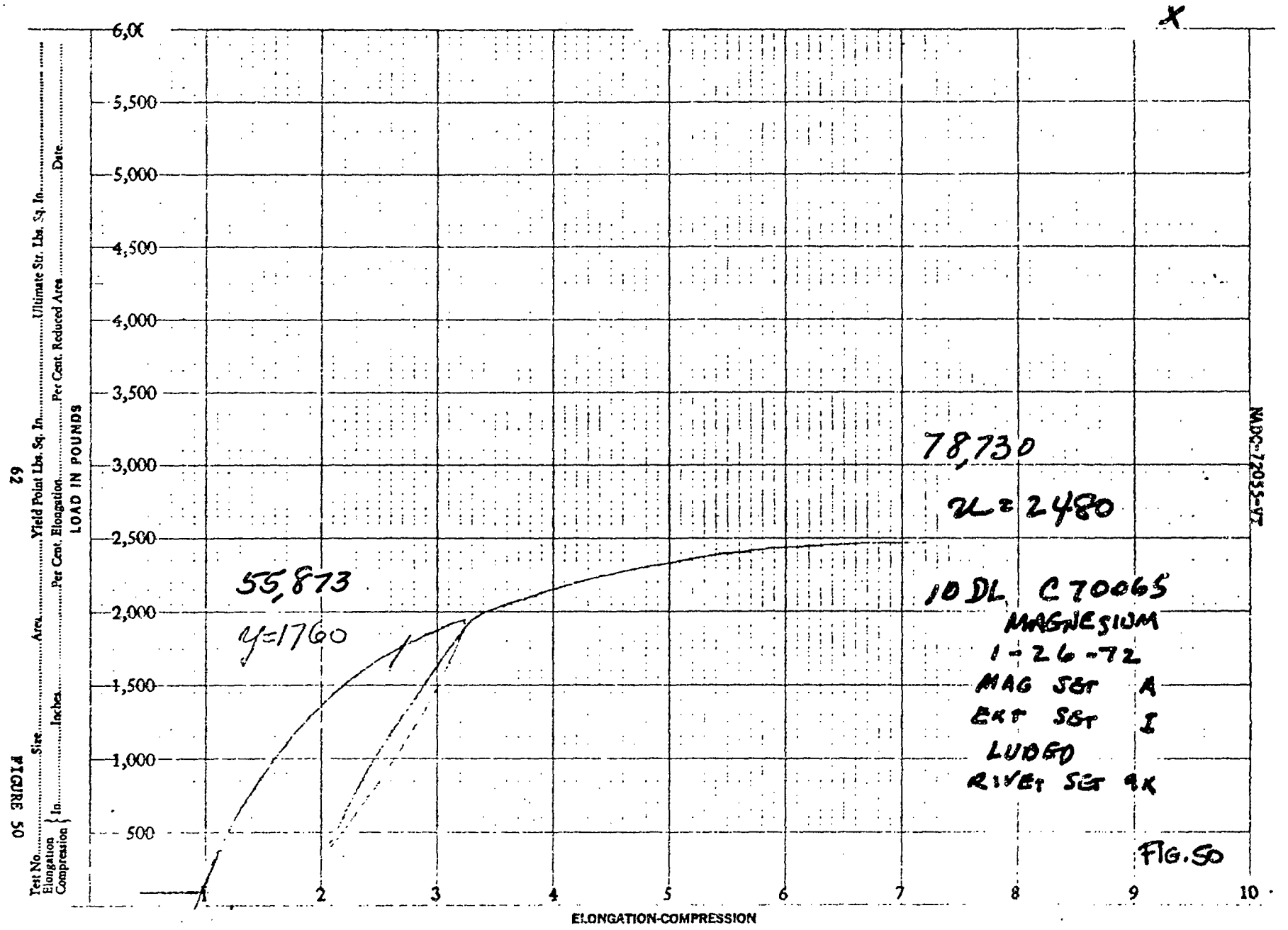
FIG. 46

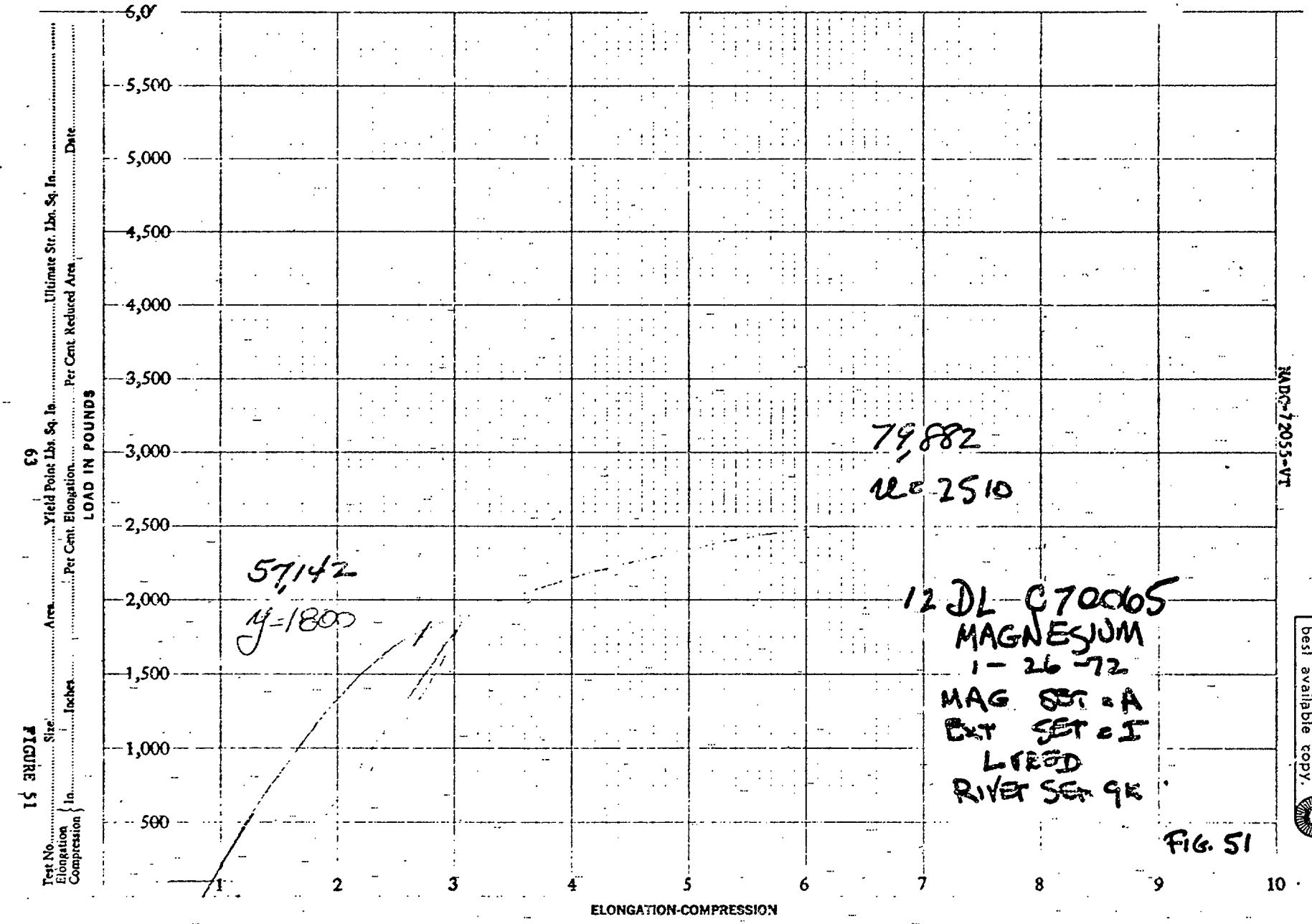


Reproduced from best available copy.


LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
77,142
e=2430
55,555
J = 1700
13 DL C70065
MAGNESIUM
1-26-72
MAG SET A
EXT SET I
LJBED
RIVET SET PK
FIG. 48
MAC-7005-ST


6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
Test No. 19
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Elongation in Inches
Per Cent. Elongation
Per Cent. Reduced Area
Compression
Date
FIGURE 49
55,873
y=1760
78,412
u=2470
16 DL C70065
MAGNESIUM (DOW)
1-27-72
MAG SET A
BLT SET I
LUBED
RIVET 9K
FIG. 49
MDC 7855-VT


X
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No. 62 Size Area Yield Point Lbs. Sq. In. Ultimate Str. Lbs. Sq. In. Date
Elongation In. Inches Per Cent. Elongation Per Cent. Reduced Area
Compression In.
FIGURE 50
78,730
U=2480
55,873
Y=1760
10 DL C70065
MAGNESIUM
1-26-72
MAG SET A
EXT SET I
LUDGD
RIVET SET 9K
FIG. 50
NADC-72055-VT



Reproduced from best available copy.

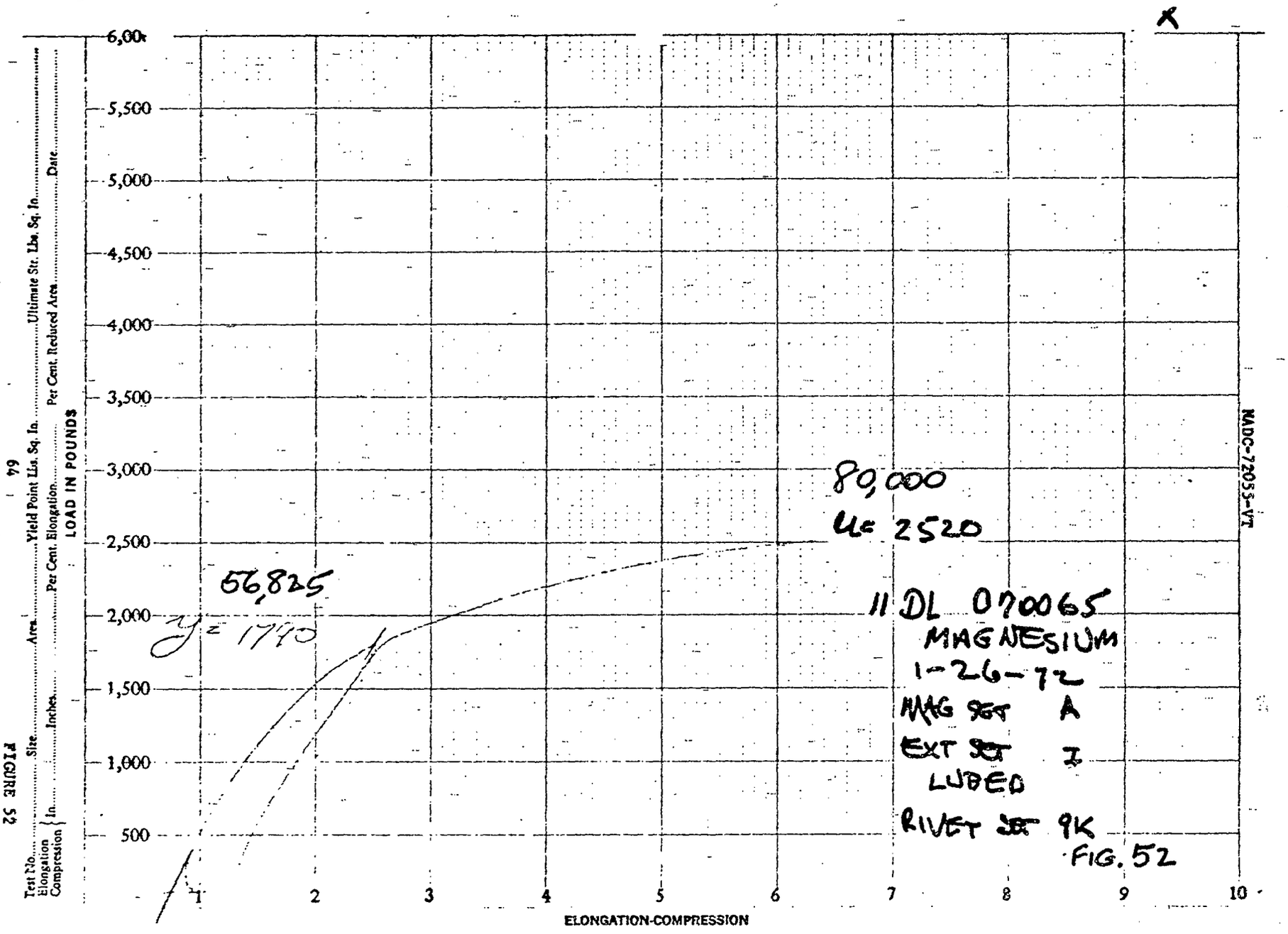

Test No.
Elongation
Compression
In.
Size
Area
Inches
Yield Point Lbs. Sq. In.
Per Cent. Elongation
Ultimate Str. Lbs. Sq. In.
Per Cent. Reduced Area
Date
LOAD IN POUNDS
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
80,000
U= 2520
56,825
y= 1770
11 DL 070065
MAGNESIUM
1-26-72
MAG SET A
EXT SET I
LUBED
RIVET SET 9K
FIG. 52
NADC-72053-VT

FIGURE 52

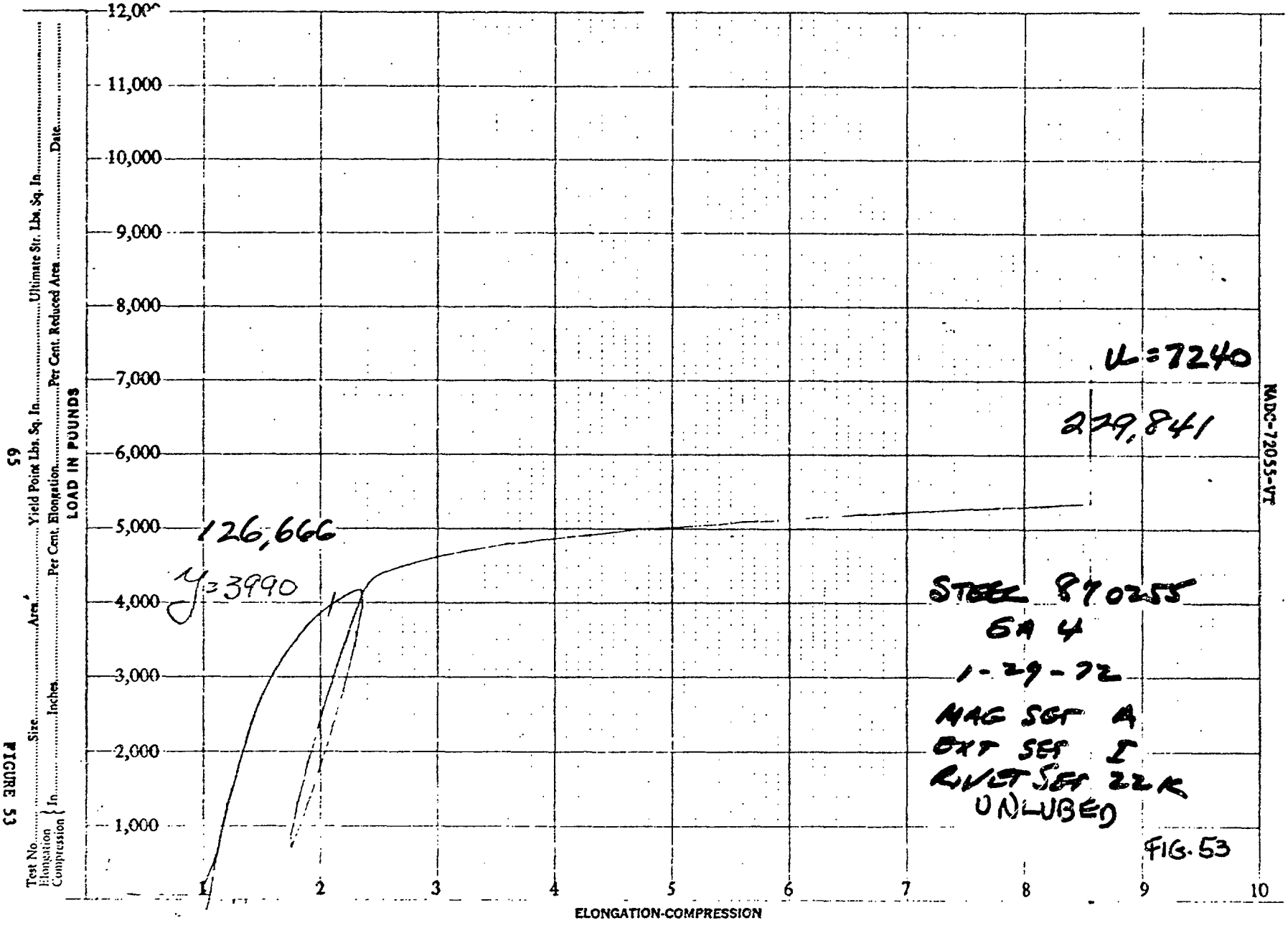
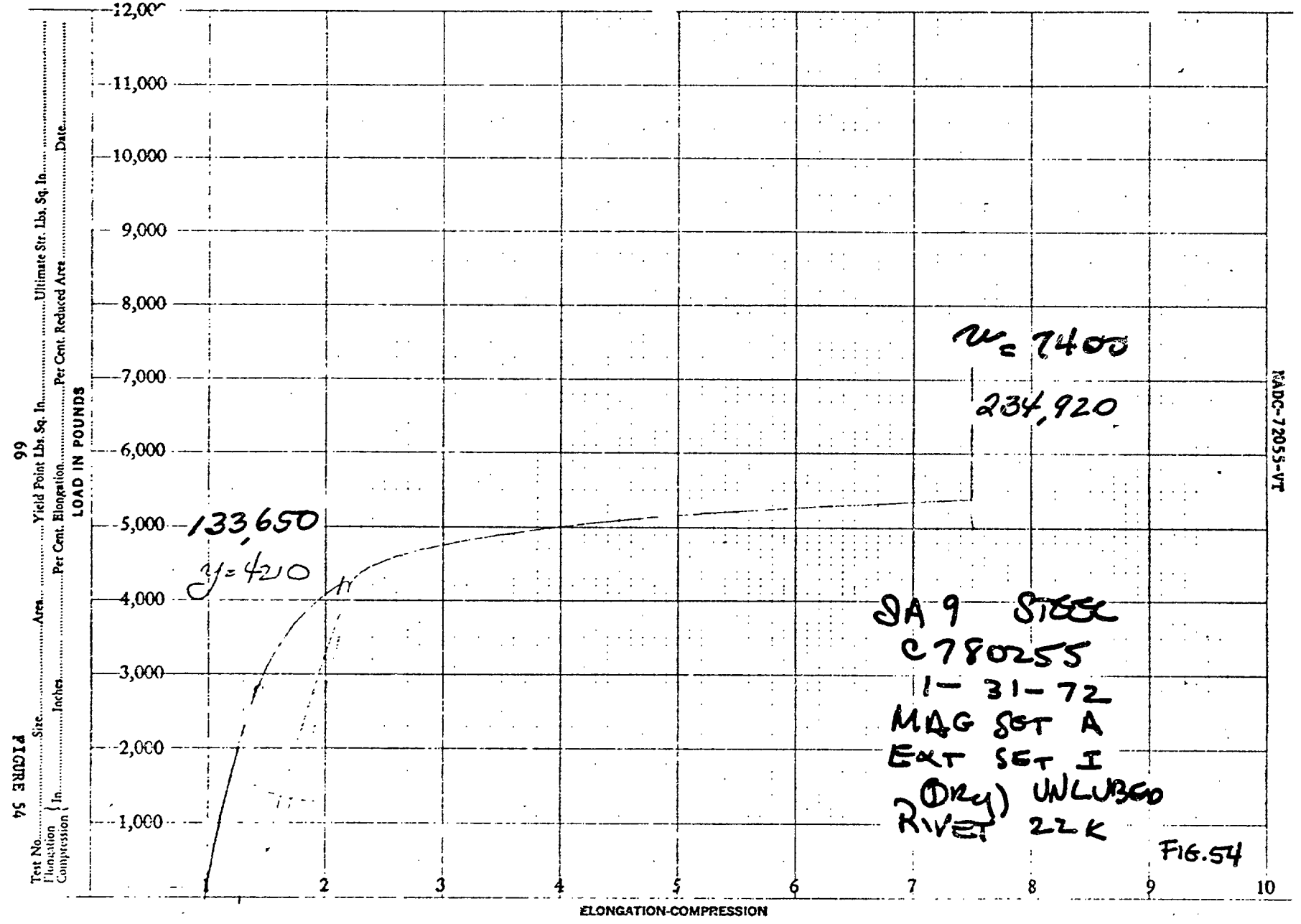
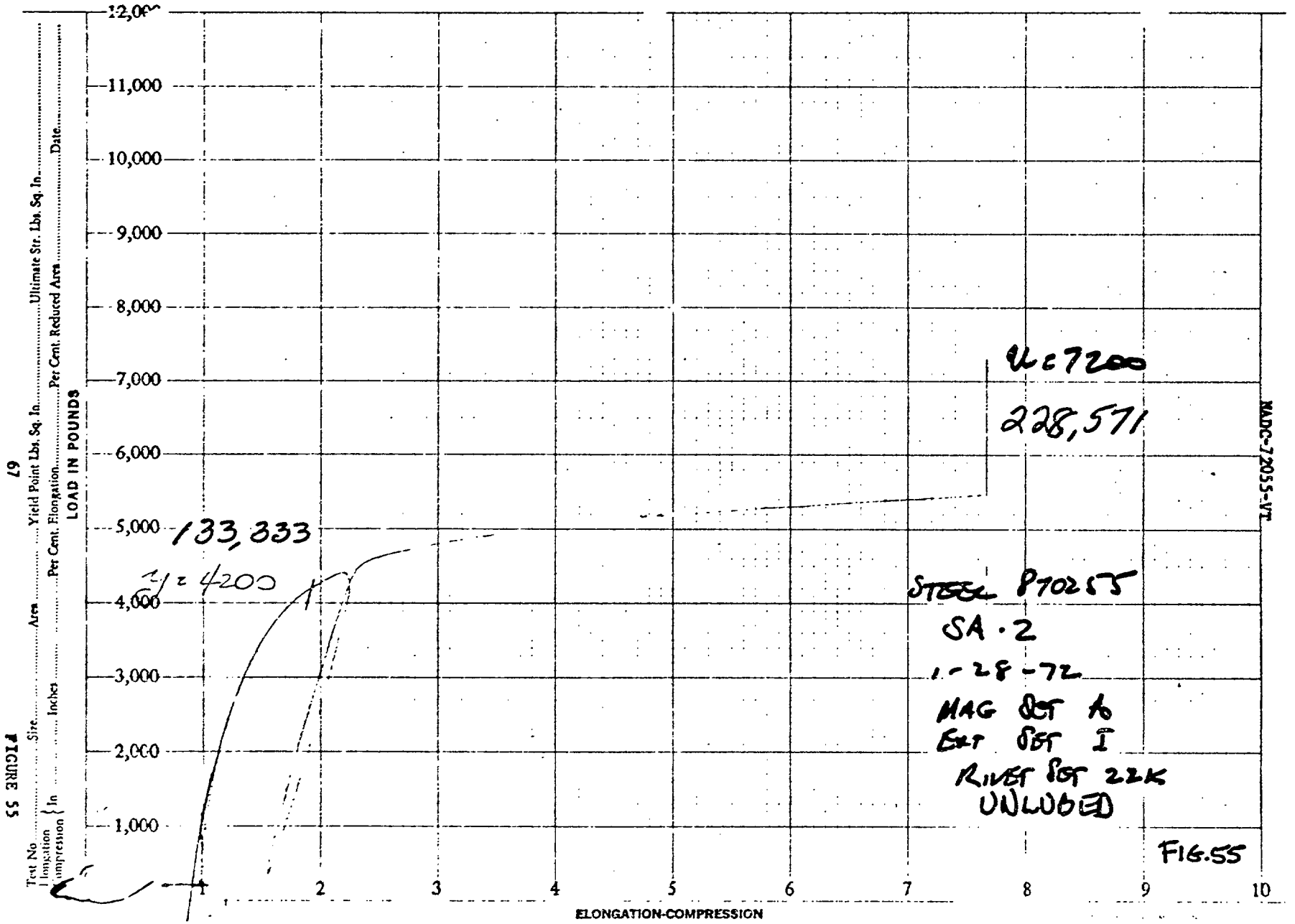

Test No. Size Area Yield Point Lbs. Sq. In. Ultimate Str. Lbs. Sq. In.
Elongation In. Per Cent. Elongation Per Cent. Reduced Area Date
Compression In. Inches
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
126,666
Y=3990
U=7240
279,841
STEEL 870255
6A 4
1-29-72
MAG SET A
EXT SET I
RIVET SET 22K
UNLUBED
FIG. 53
MADC-72055-VT

FIGURE 53


99
FIGURE 54
Test No.
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Elongation (In.
Compression (In.
Per Cent. Elongation
Per Cent. Reduced Area
Date
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
133,650
y=420
u=7400
234,920
SA 9 STEEL
C780255
1-31-72
MAG SET A
EXT SET I
(DRY) UNLUBED
RIVET 22K
F16.54
NADC-72055-VT


Test No. ..... Size ..... Area ..... Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. .....
Elongation { In ..... Per Cent. Elongation ..... Per Cent. Reduced Area .....
Compression { In ..... Inches ..... Date .....
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
133,333
Y = 4200
U = 7200
228,571
STEEL P70215
SA-2
1-28-72
MAG DET to
EDT DET I
RIVET DET 22K
UNLOADED
FIG.55
NADC-72055-VT
FIGURE 55
67

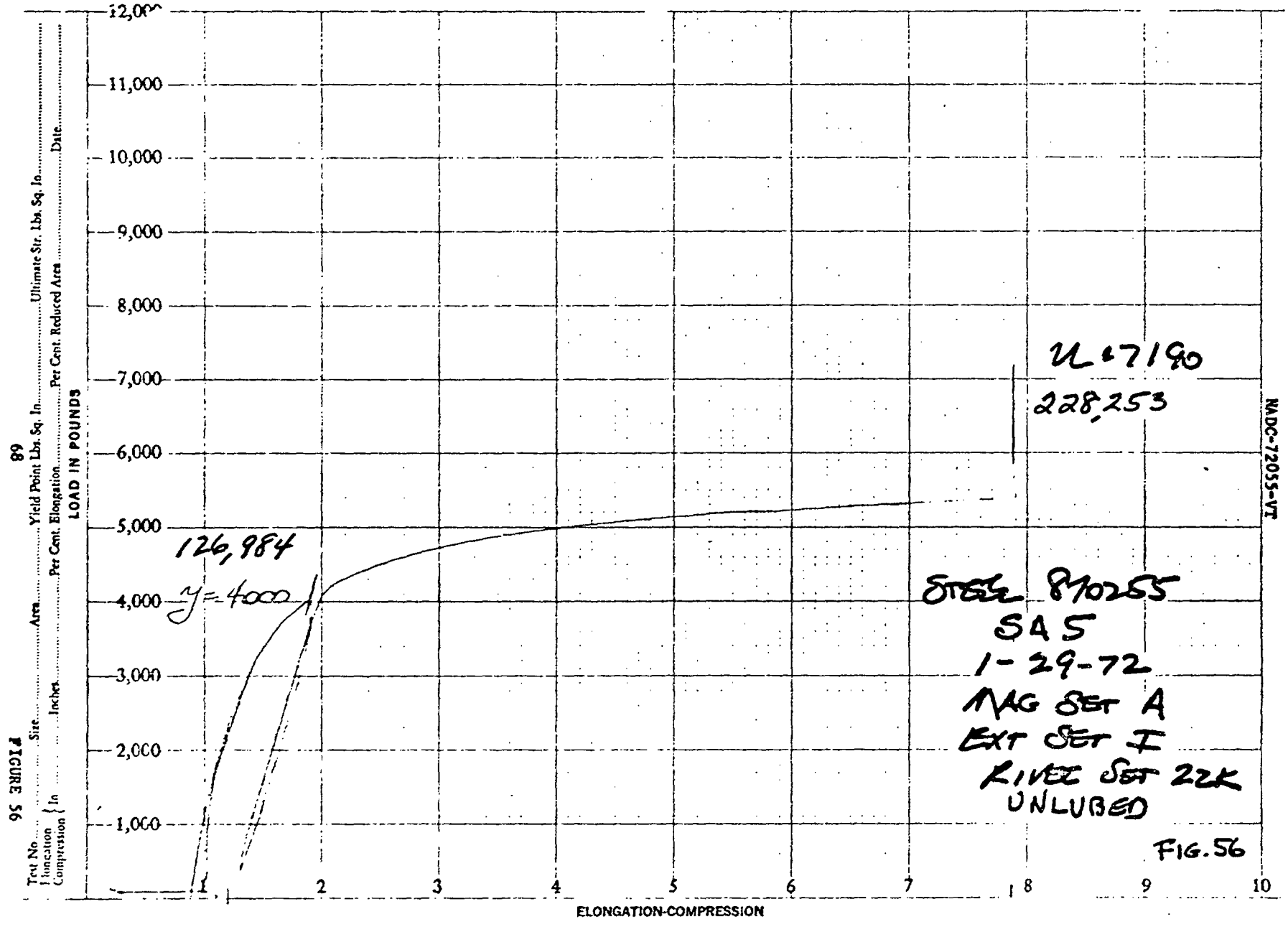


FIGURE 56
Test No. 89
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Elongation { In Inches Per Cent. Elongation
Compression { In Per Cent. Reduced Area
Date
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
126,984
y=4000
U=7190
228,253
STEEL 810255
SAS
1-29-72
MAG SET A
EXT SET I
RIVET SET 22K
UNLUBED
FIG. 56

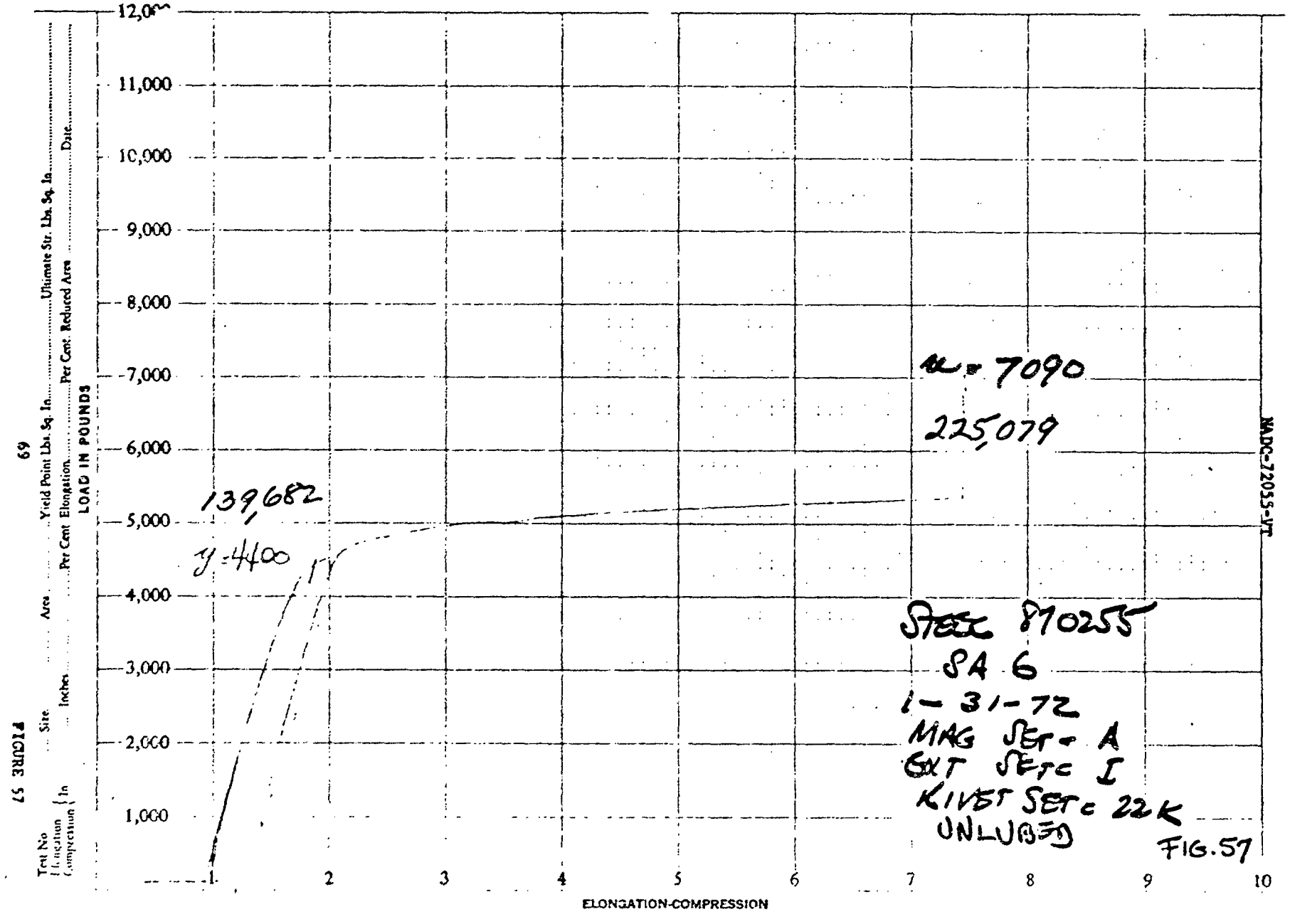


FIGURE 57
69
Test No
Elongation } In
Compression }
Size
Area
Inches
Yield Point Lbs. Sq. In.
Per Cent Elongation
Ultimate Str. Lbs. Sq. In.
Per Cent. Reduced Area
Date
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
MADC-72055-VT
139,682
y=4400
x=7090
225,079
STEEL 870255
SA 6
1-31-72
MAG SET= A
EXT SET= I
RIVET SET= 22K
UNLUBED
FIG.57

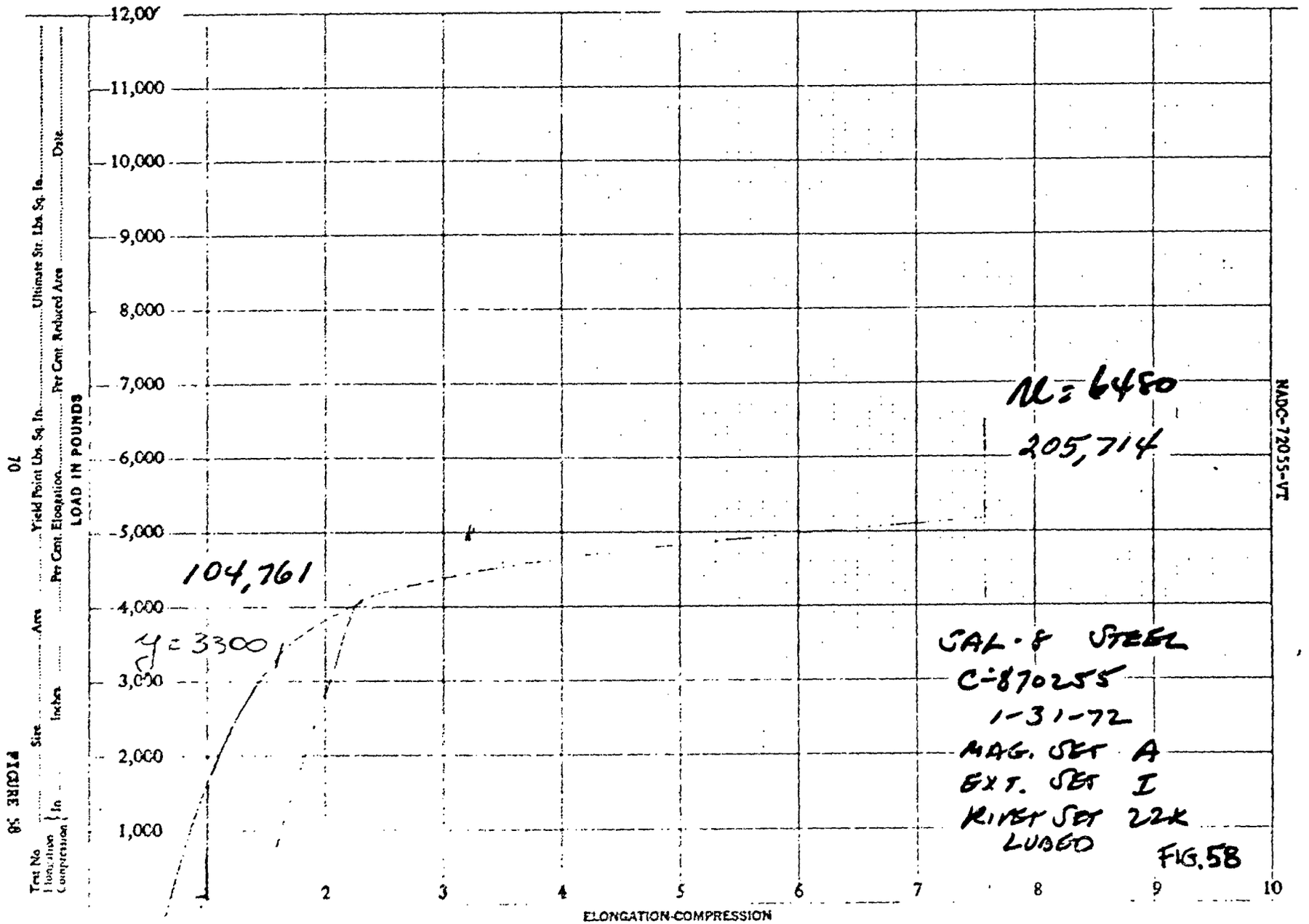
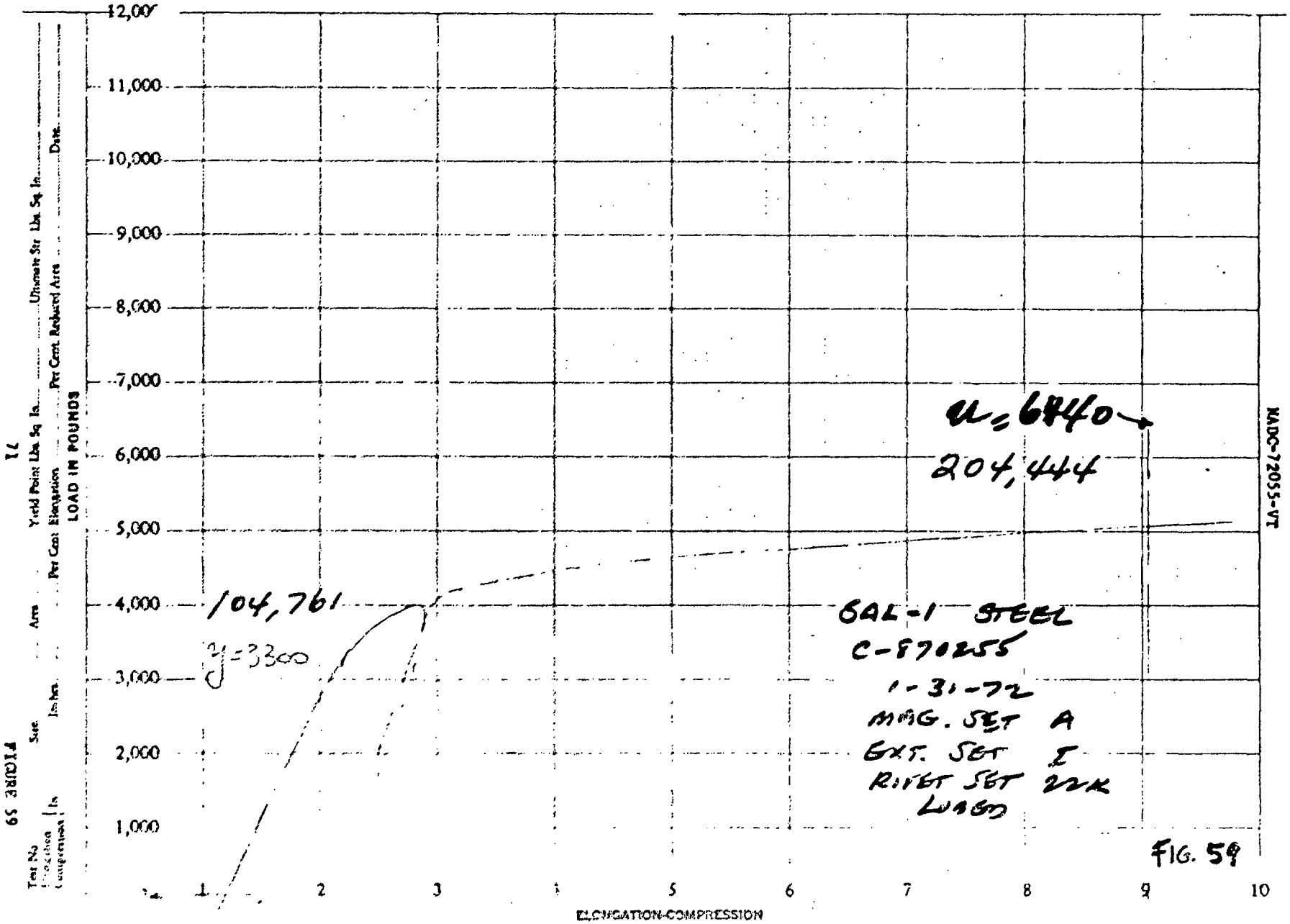

12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No
Elongation } In
Compression }
Size
Area
Inches
Yield Point Lbs. Sq. In.
Per Cent. Elongation
Ultimate Str. Lbs. Sq. In.
Per Cent. Reduced Area
Date
104,761
Y = 3300
N = 6480
205,714
CAL-8 STEEL
C-870255
1-31-72
MAG. SET A
EXT. SET I
RIVET SET 22K
LUBED
FIG. 58
NADC-72055-VT

FIGURE 58


12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
5
6
7
8
9
10
ELONGATION-COMPRESSION
u = 6440
204,444
104,761
E = 3300
GAL-1 STEEL
C-870255
1-31-72
MAG. SET A
EXT. SET E
RIVET SET 22K
LUGS
NADC-72055-VT
FIG. 59

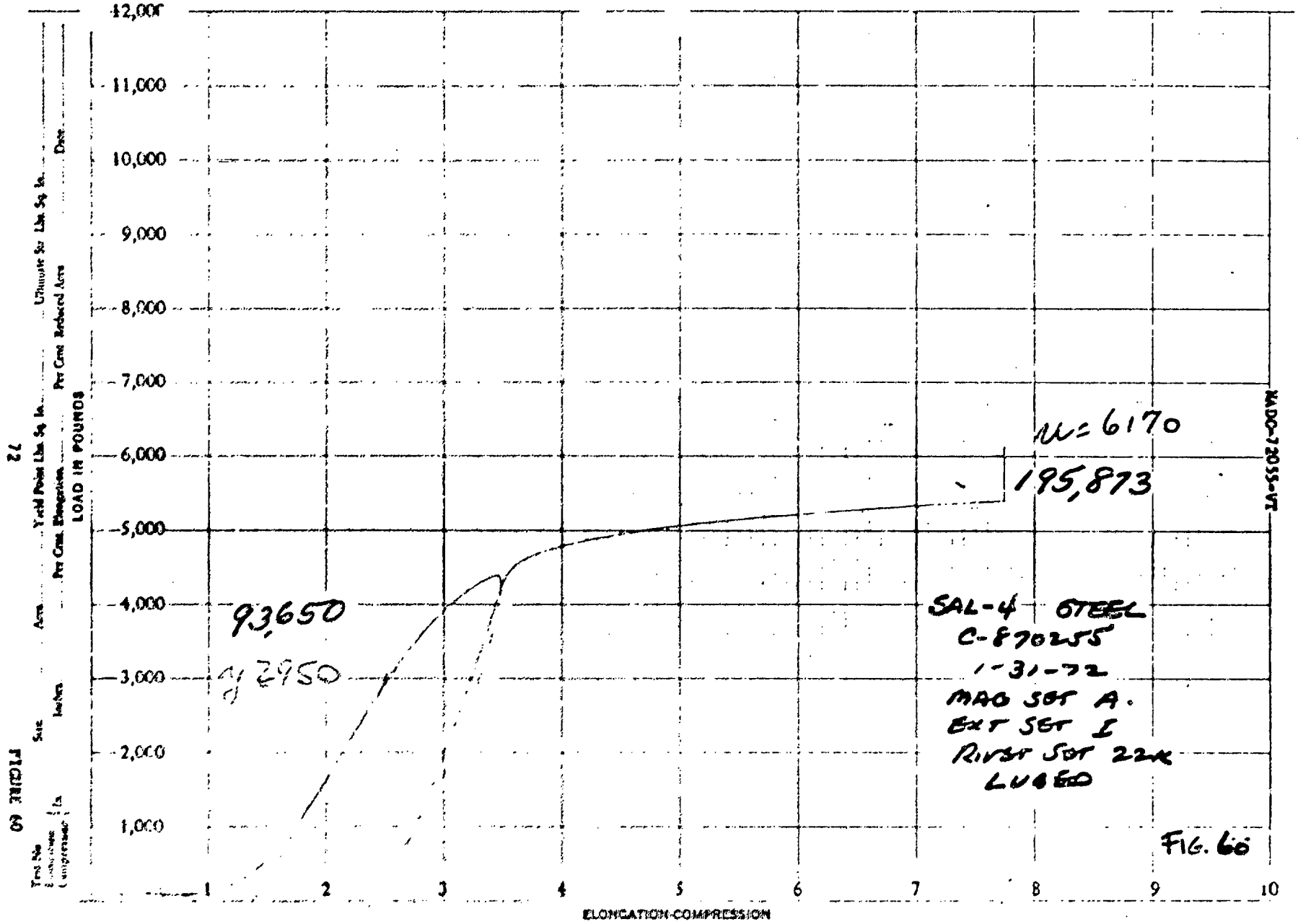
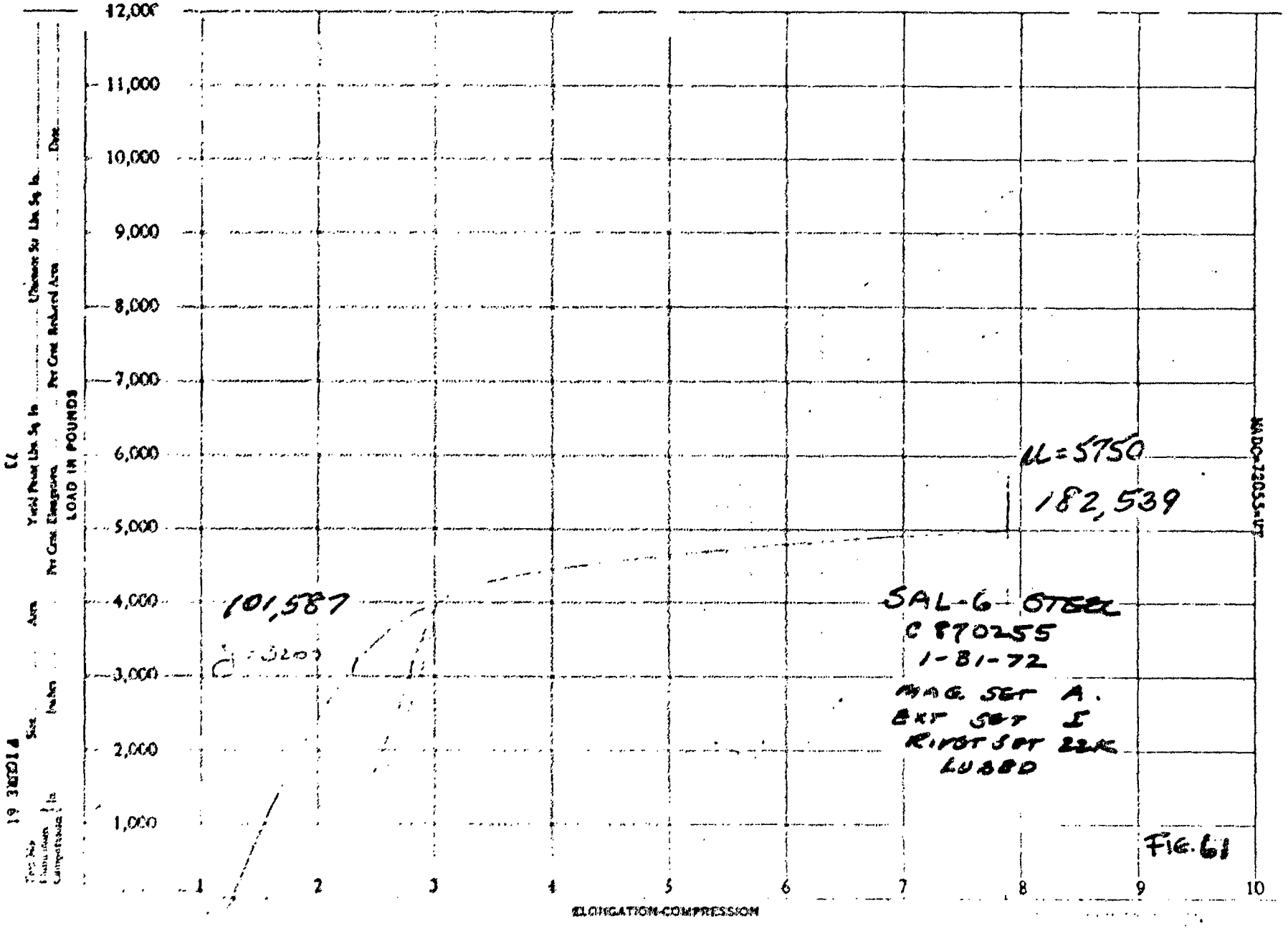


FIGURE 69

Fig. 66


12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
101,587
UL=5750
182,539
SAL-6 STEEL
C 870255
1-81-72
MAG SET A.
EXT SET I
RIVET SET 22K
LUBED
FIG. 61

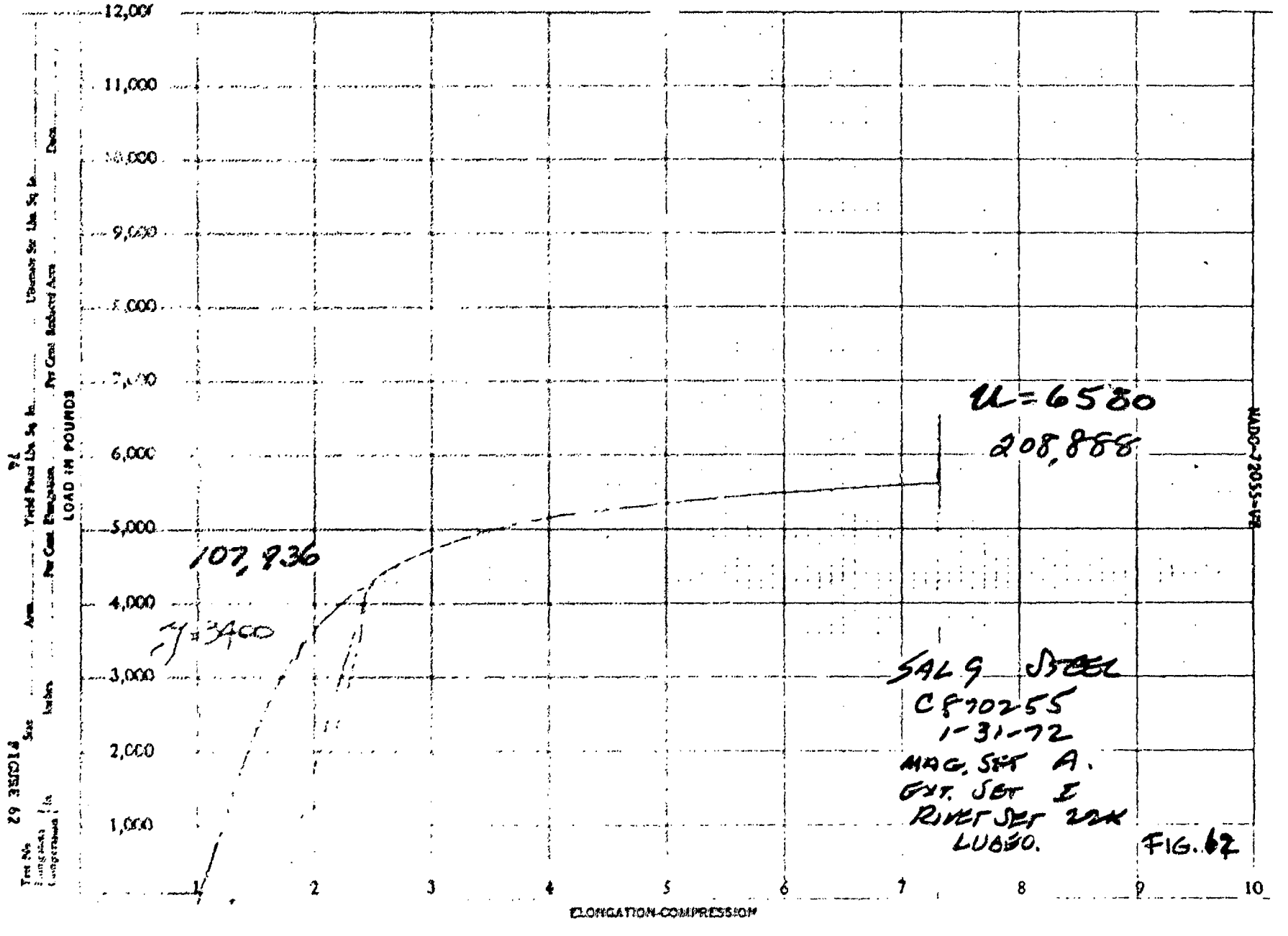

12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No. 29 35D14
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Inches
Per Cent Elongation
Per Cent Reduced Area
Date
MADC-72055-SA
107,936
E = 3400
U = 6580
208,888
SAE 9 STEEL
CF70255
1-31-72
MAG. SET A.
EXT. SET E
RIVET SET 22K
LUBE.

FIG. 67

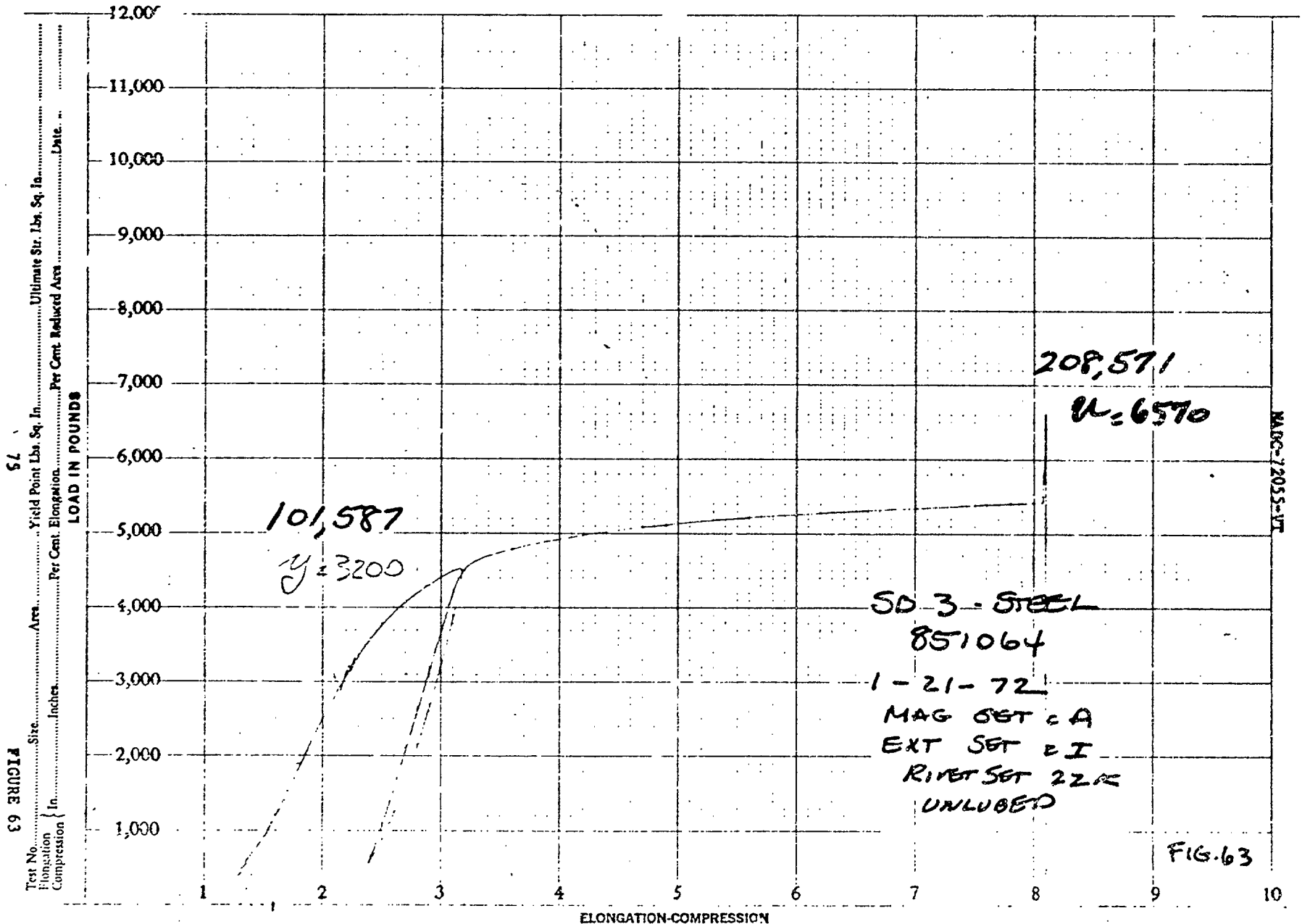

12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No.
Elongation
Compression
In.
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Per Cent. Elongation
Per Cent. Reduced Area
Date
101,587
y = 3200
208,571
u = 6570
SD 3 - STEEL
851064
1-21-72
MAG SET = A
EXT SET = I
RIVET SET 22K
UNLUBED
FIG. 63
MARC-72055-XT

FIGURE 63

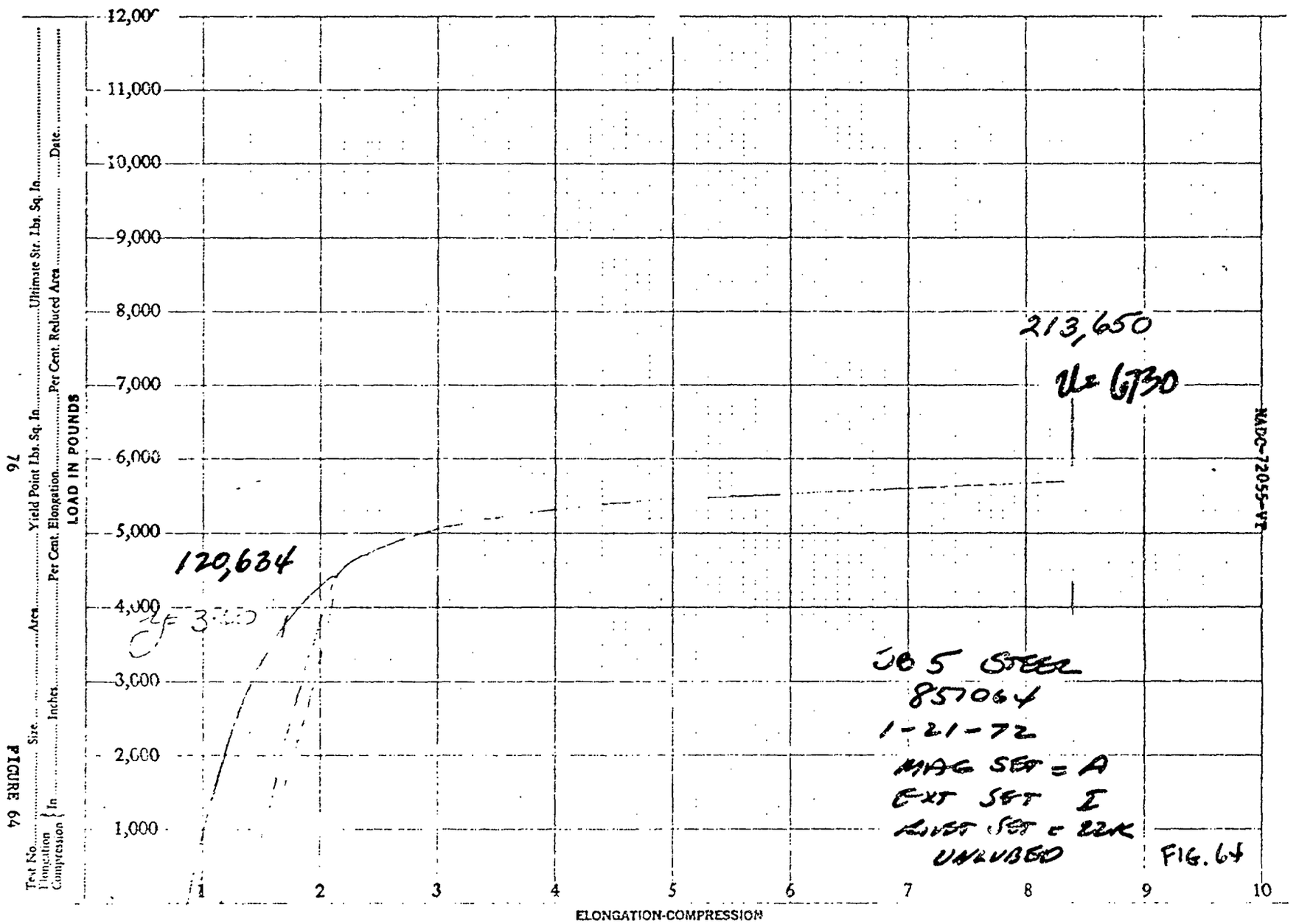

12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No. 76
Size ... Area ... Yield Point Lbs. Sq. In. ... Ultimate Str. Lbs. Sq. In. ...
Elongation } In ... Inches ... Per Cent. Elongation ... Per Cent. Reduced Area ... Date ...
Compression }
213,650
UE 6730
120,634
OF 3750
J&S STEEL
857064
1-21-72
MAG SET = A
EXT SET I
LOAD SET = 22K
UNAGED
FIG. 64
MADC-72055-VT

FIGURE 64

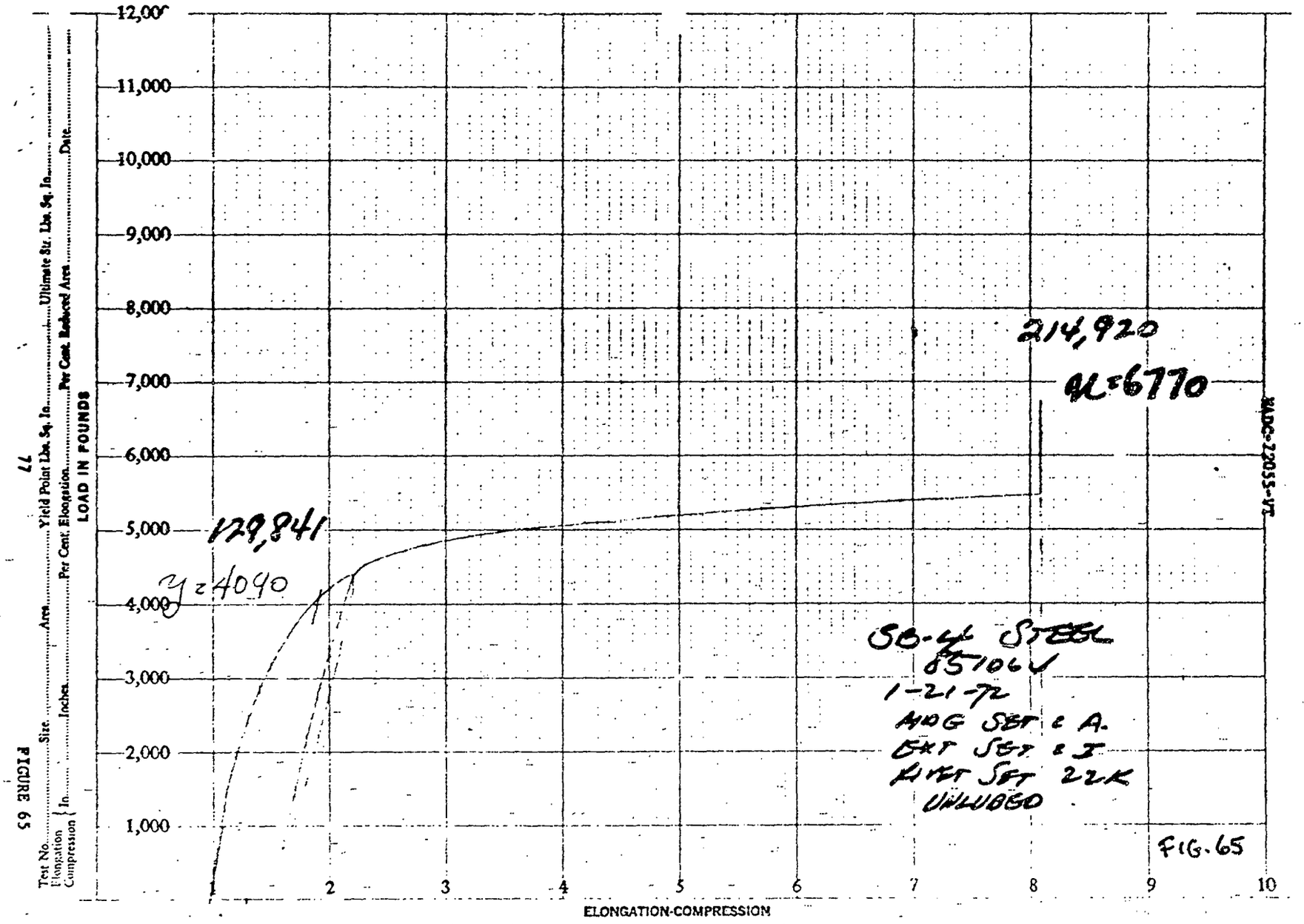
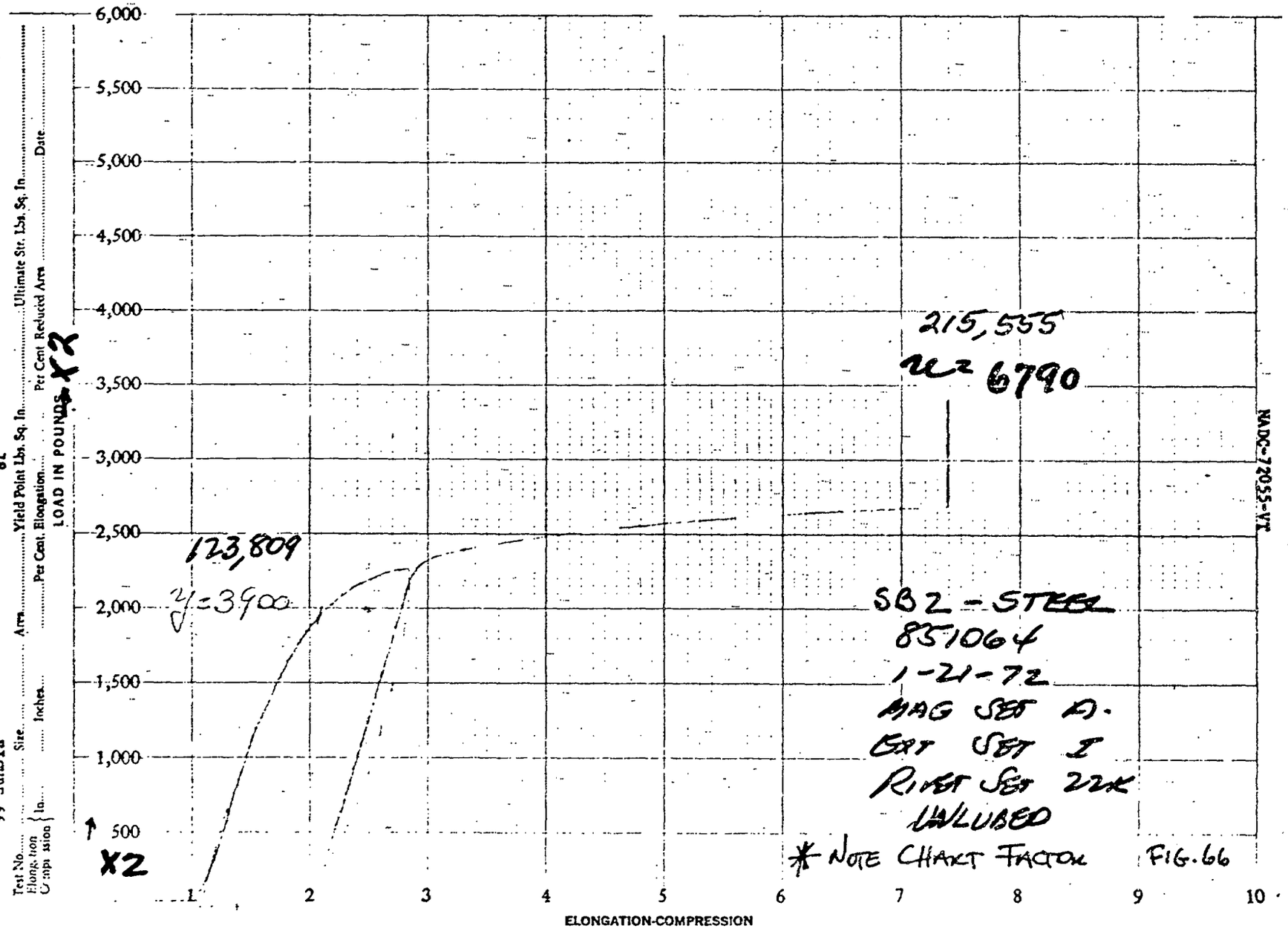

77
Test No. Size Area Yield Point Lbs. Sq. In. Ultimate Str. Lbs. Sq. In.
Elongation In. Per Cent. Elongation Per Cent. Reduced Area Date
Compression
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
129,841
Y=4090
214,920
U=6770
SB-4 STEEL
B5104
1-21-72
MOG SET # A.
EXT SET # I
RIVET SET 22K
UNLUBED
FIG. 65
MADC-22055-VT

FIGURE 65


6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
LOAD IN POUNDS X2
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No.
Elongation
Compression
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Per Cent. Elongation
Per Cent Reduced Area
Date
Inches
215,555
U2 6790
123,809
Y=3900
SB2-STEEL
851064
1-21-72
MAG SET A.
EXT SET I
RIVET SET 22K
UNLUBED
* NOTE CHART FACTOR
FIG. 66
NADC-72055-VT

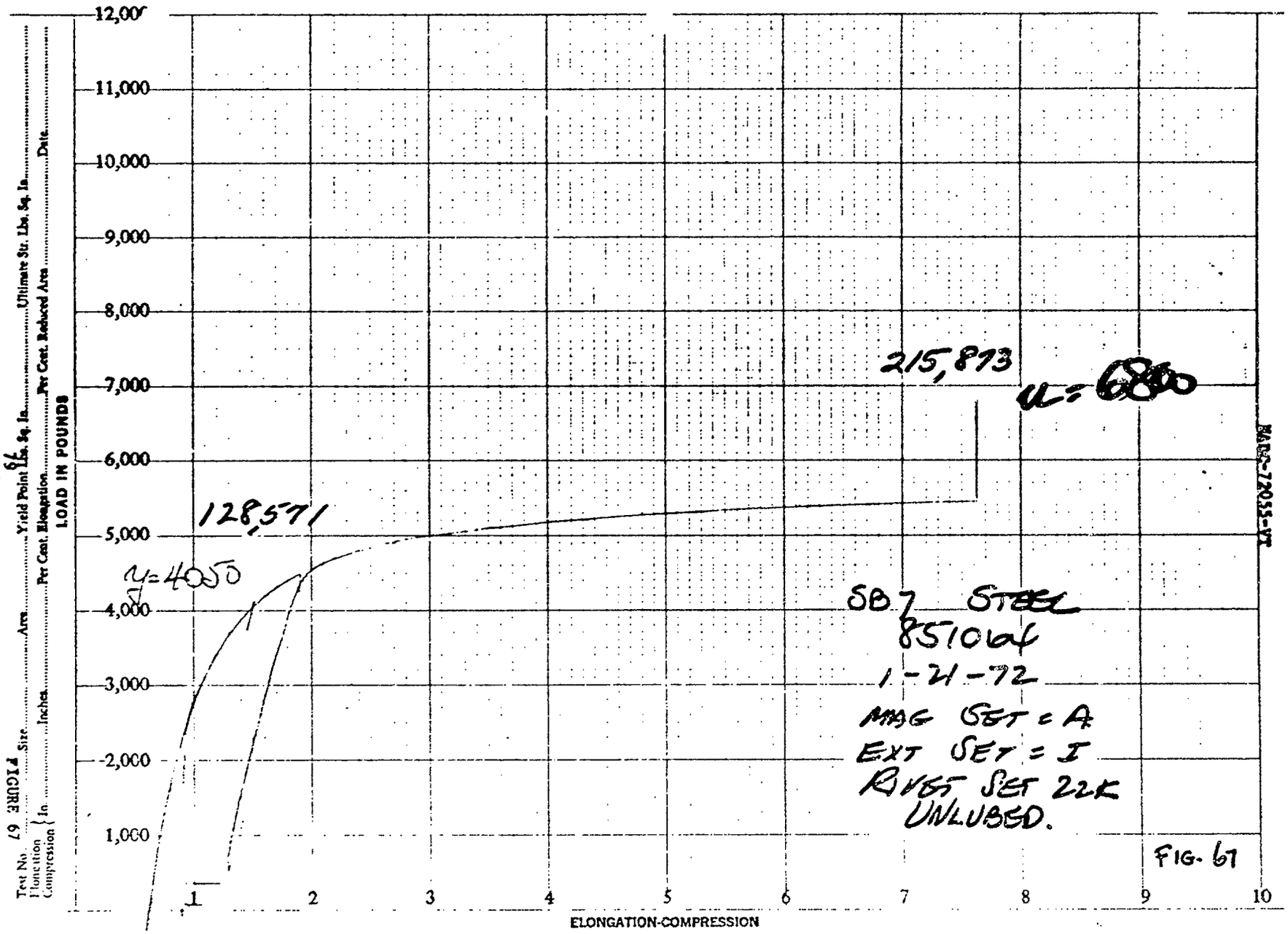

12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
215,873
u=6800
128,571
y=4050
SB7 STEEL
851064
1-21-72
MAG SET = A
EXT SET = I
RVDT SET 22K
UNLUBED.
FIG. 67
MARC-72055-VT
Test No. 66
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Elongation { In. Inches
Compression { In.
Per Cent. Elongation
Per Cent. Reduced Area
Date

FIGURE 67

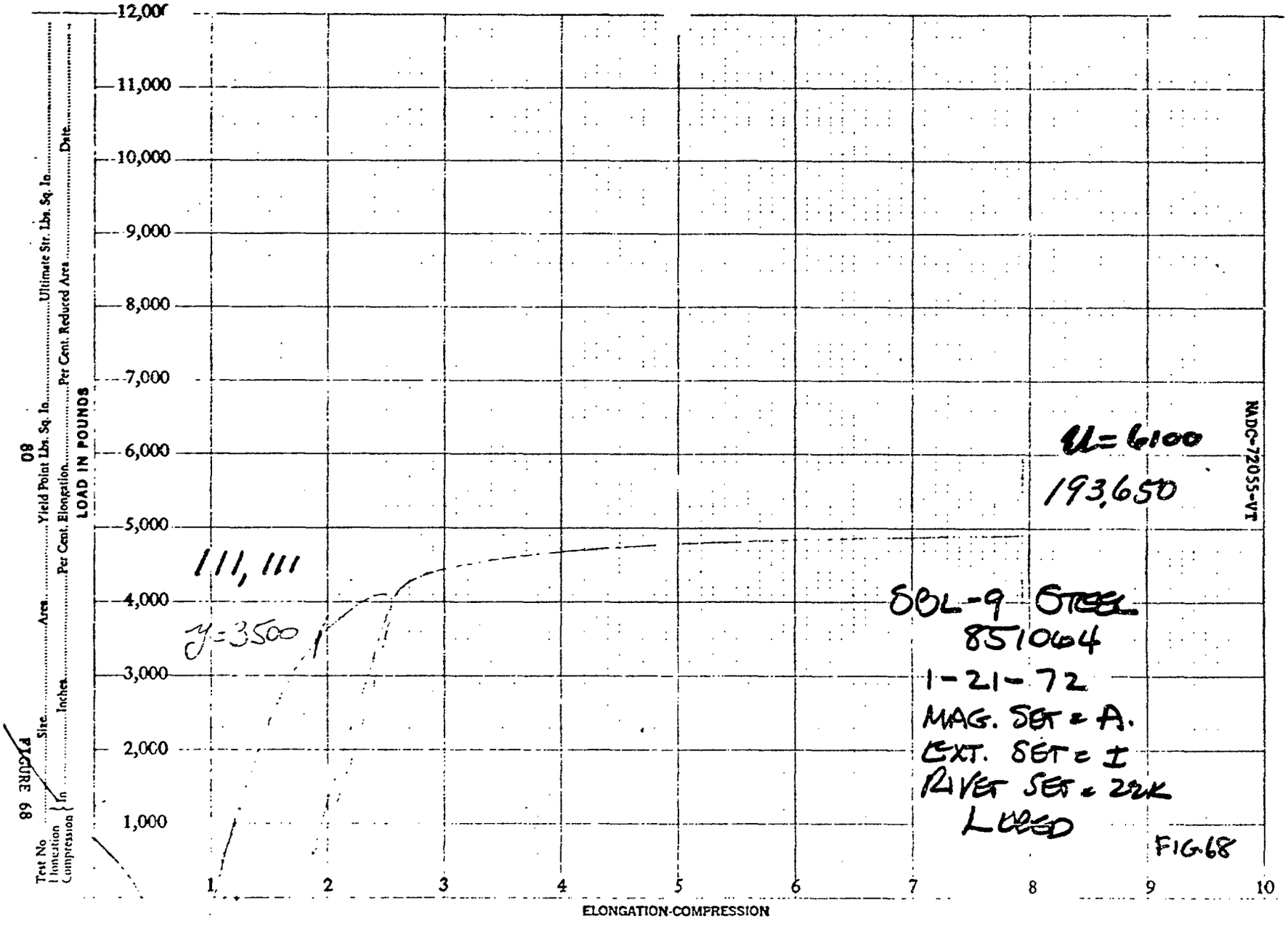


FIGURE 68
Test No
Elongation
Compression
Size
Area
Inches
In
Yield Point Lbs. Sq. In.
Per Cent. Elongation
Ultimate Str. Lbs. Sq. In.
Per Cent. Reduced Area
Date
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
U=6100
193,650
111,111
y=3500
SBL-9 STEEL
851064
1-21-72
MAG. SET = A.
EXT. SET = I
RIVET SET = 22K
LOADED
FIG-68

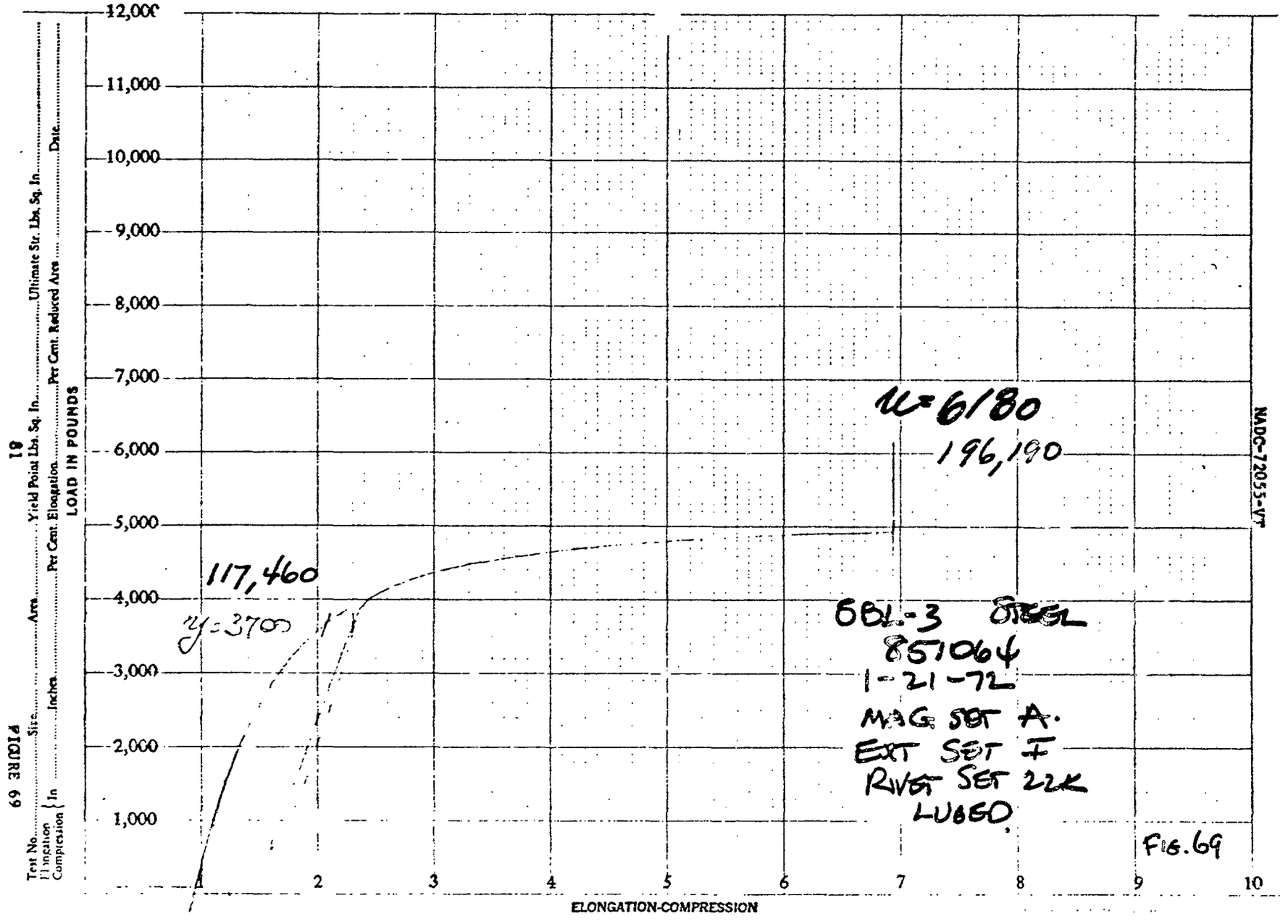

Test No. 69 38 D14
Elongation
Compression } In
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Inches
Per Cent. Elongation
Per Cent. Reduced Area
Date
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
117,460
y=3700
u=6180
196,190
6BL-3 STEEL
851064
1-21-72
MAG SET A.
EXT SET F
RIVET SET 22K
LUBED

FIG. 69

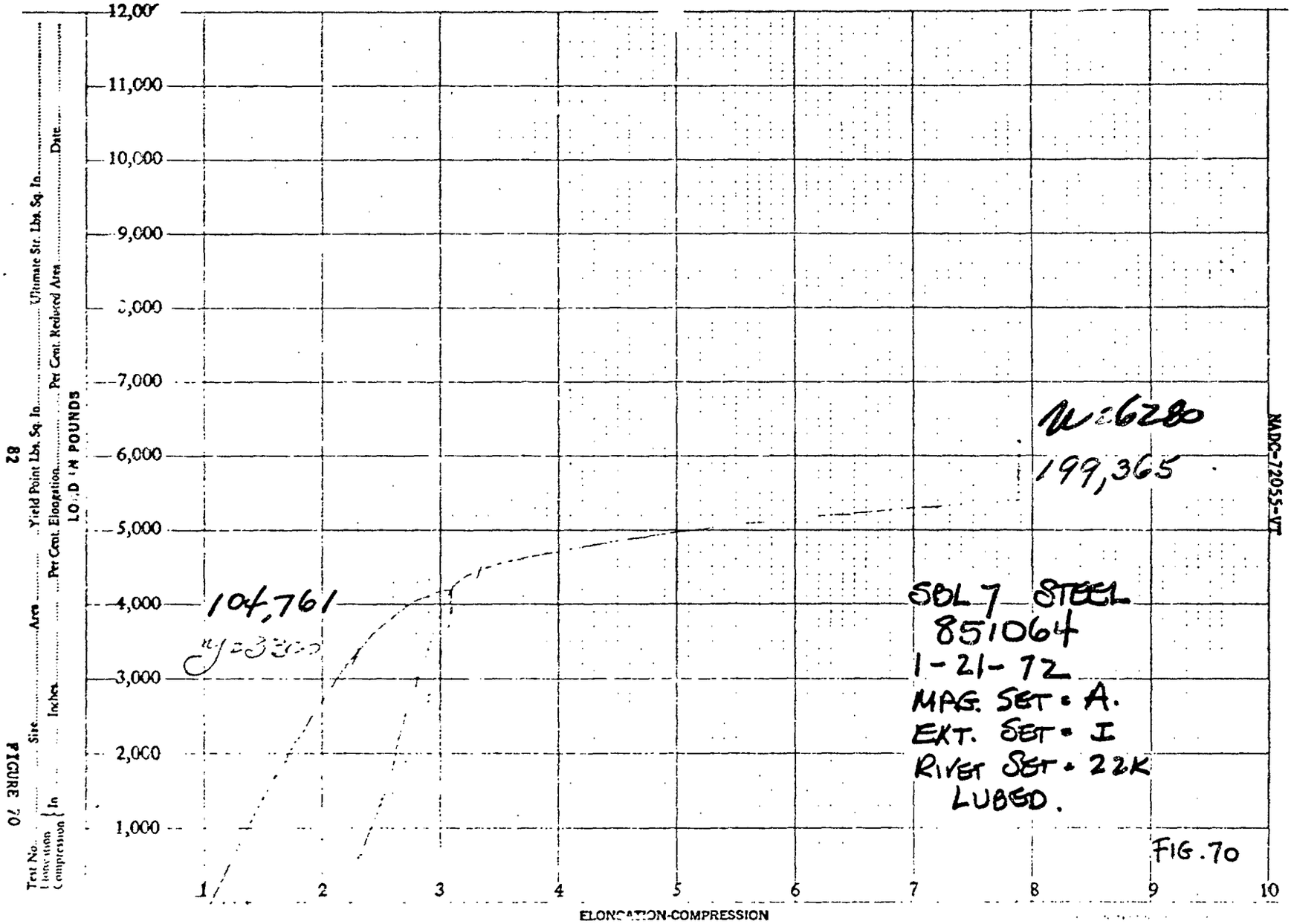

12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No.
Elongation
Compression
Size
Area
Yield Point Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
In
Inches
Per Cent. Elongation
Per Cent. Reduced Area
Date
104,761
N=3300
N=6280
199,365
SBL 7 STEEL
851064
1-21-72
MAG. SET • A.
EXT. SET • I
RIVET SET • 22K
LUBED.
FIG. 70
NADC-72055-VT

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FIGURE 70

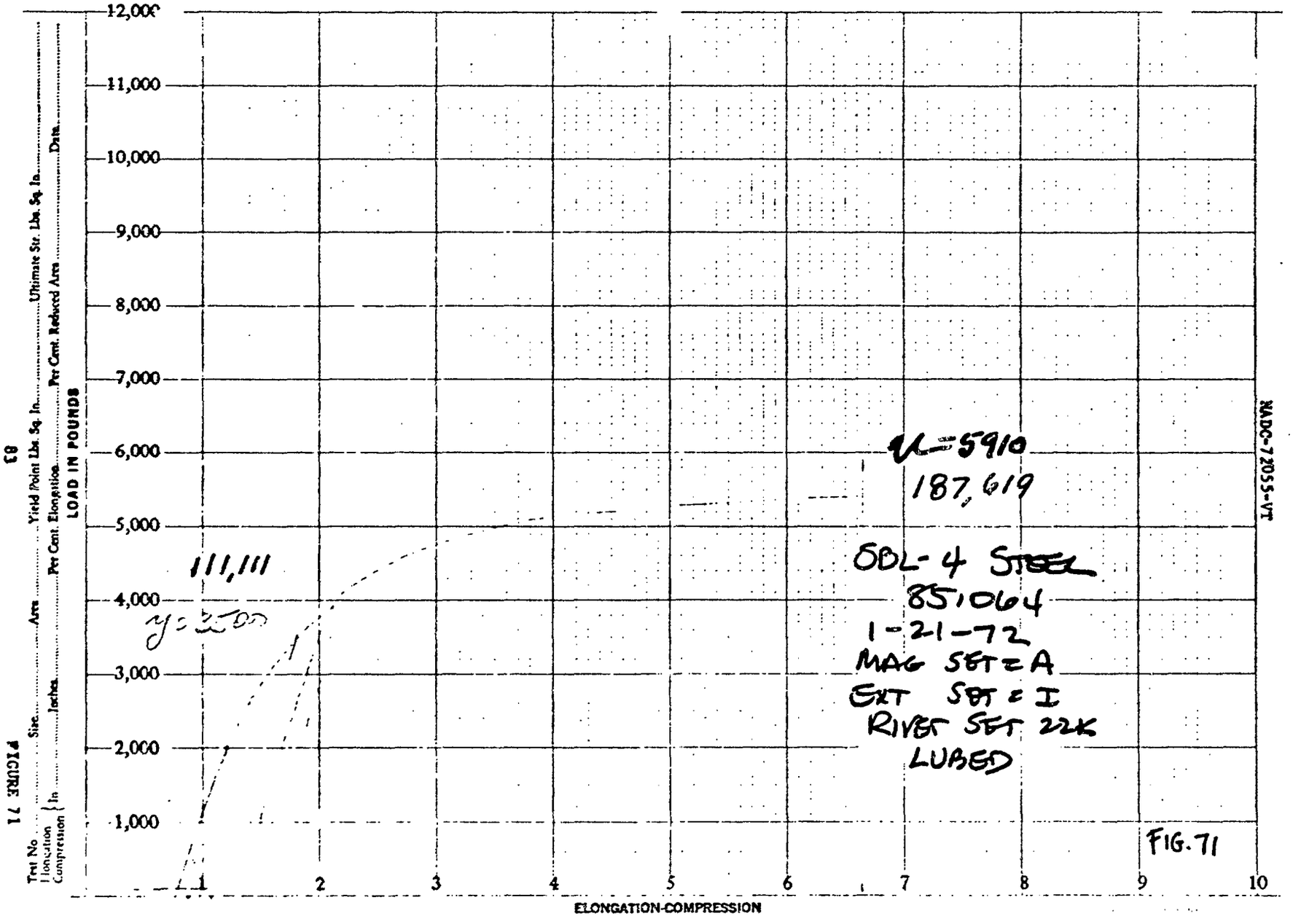


FIGURE 71
Test No. ..... Size ..... Area ..... Yield Point Lbs. Sq. In. ..... Ultimate Str. Lbs. Sq. In. .....
Elongation } In ..... Per Cent. Elongation ..... Per Cent. Reduced Area .....
Compression } Inches ..... Date .....
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
NADC-72055-VT
111,111
y=250
U=5910
187,619
SDL-4 STEEL
851064
1-21-72
MAG SET=A
EXT SET=I
RIVET SET 22K
LUBED
FIG. 71

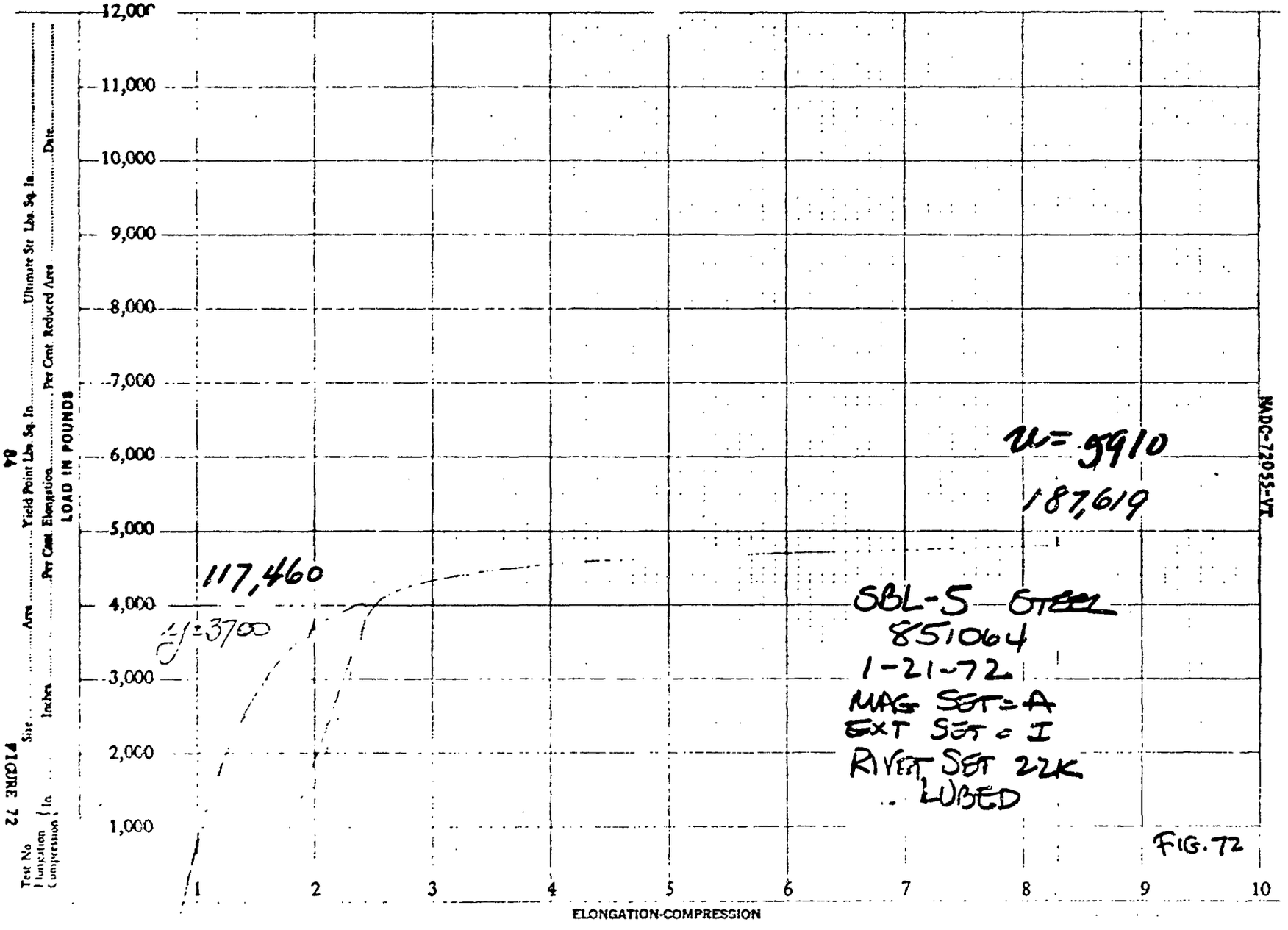
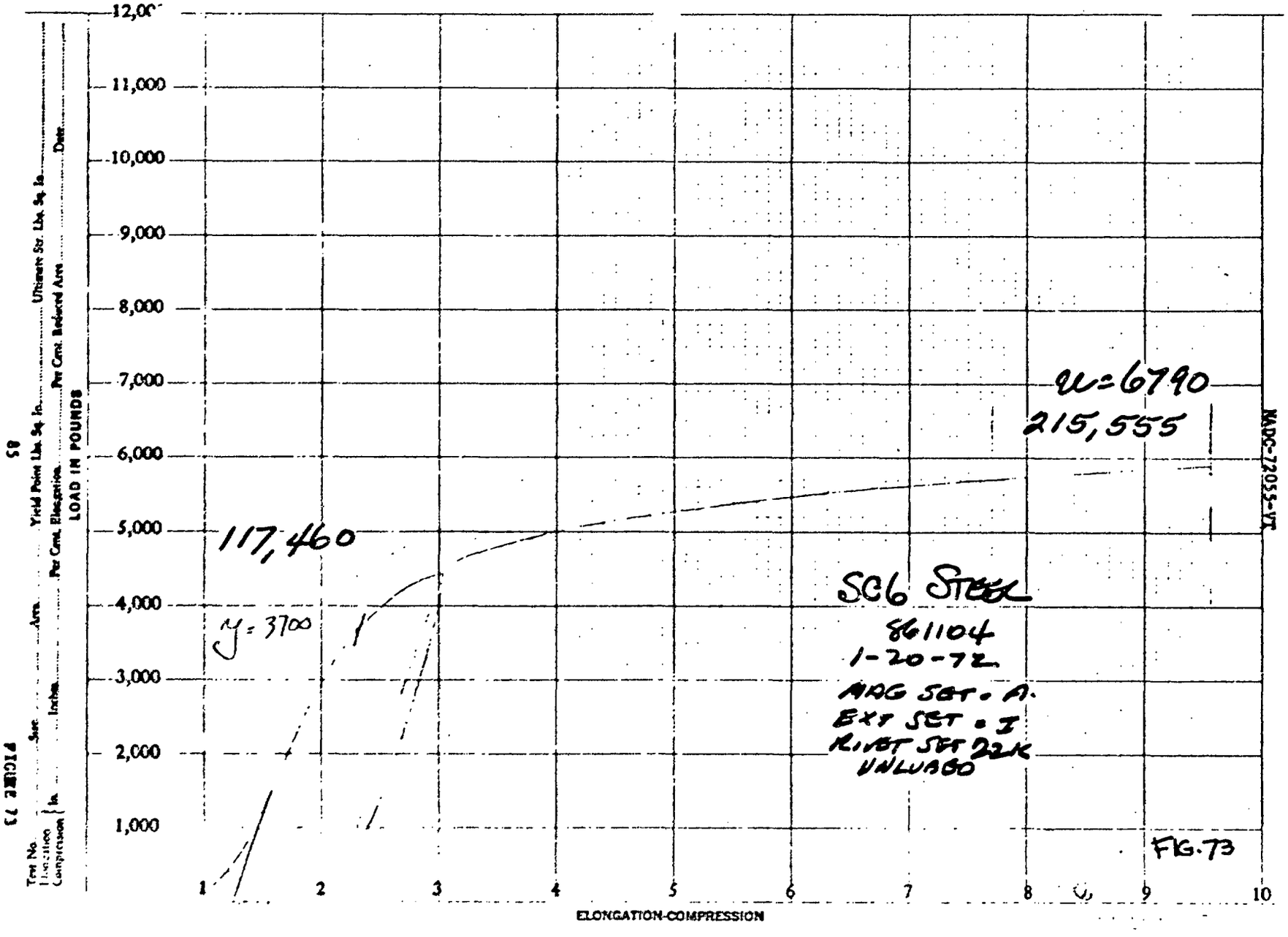
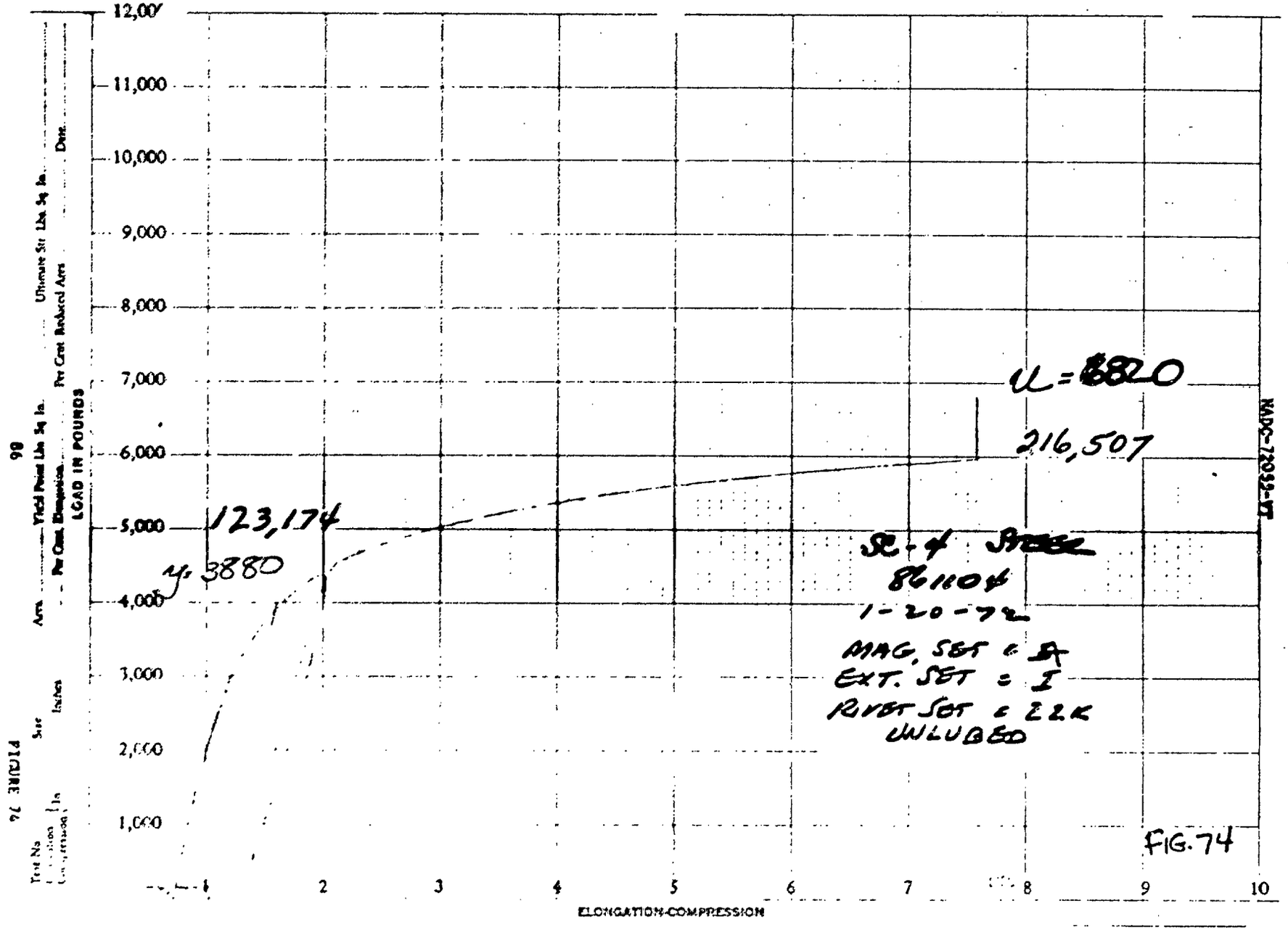
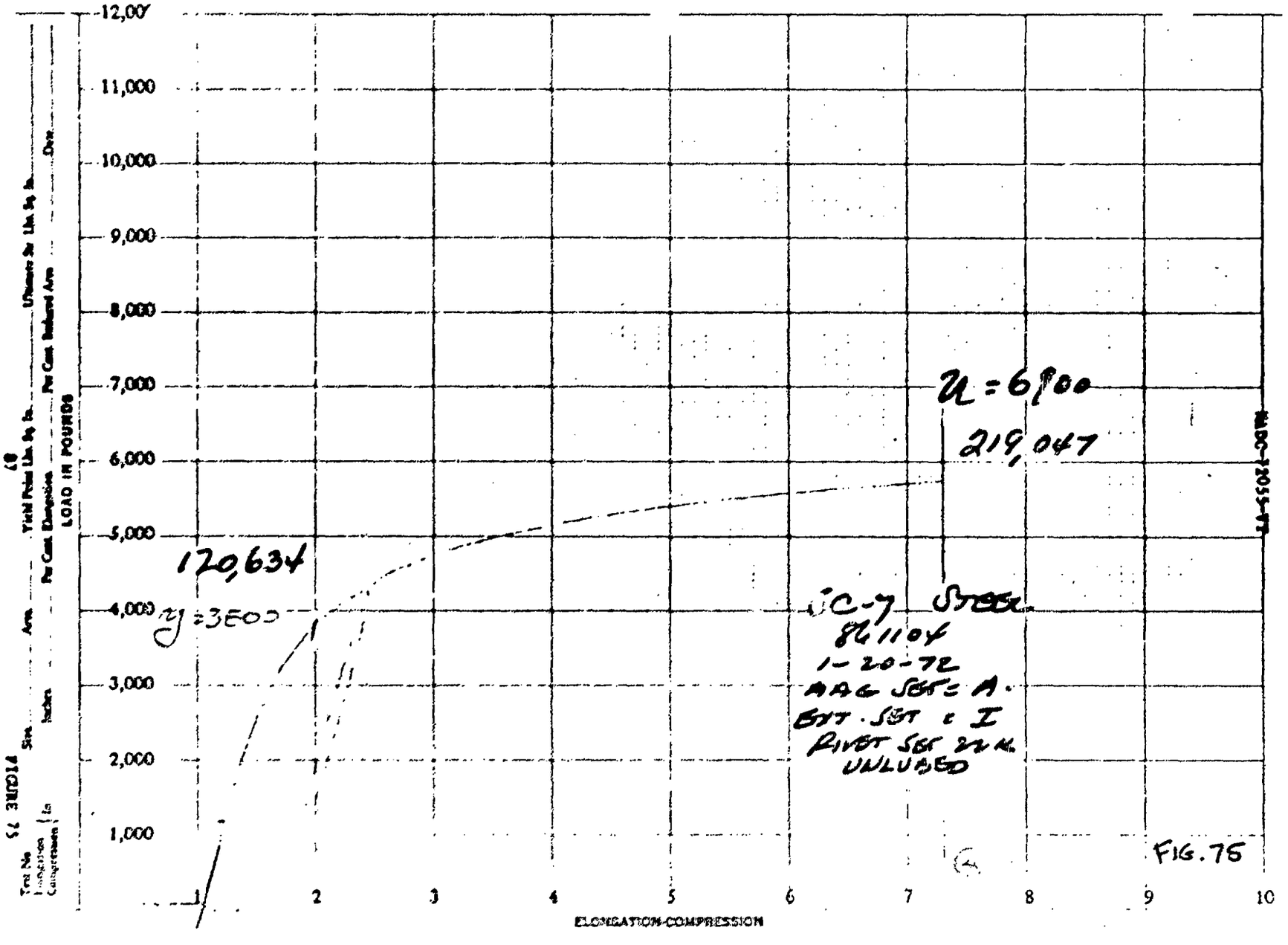
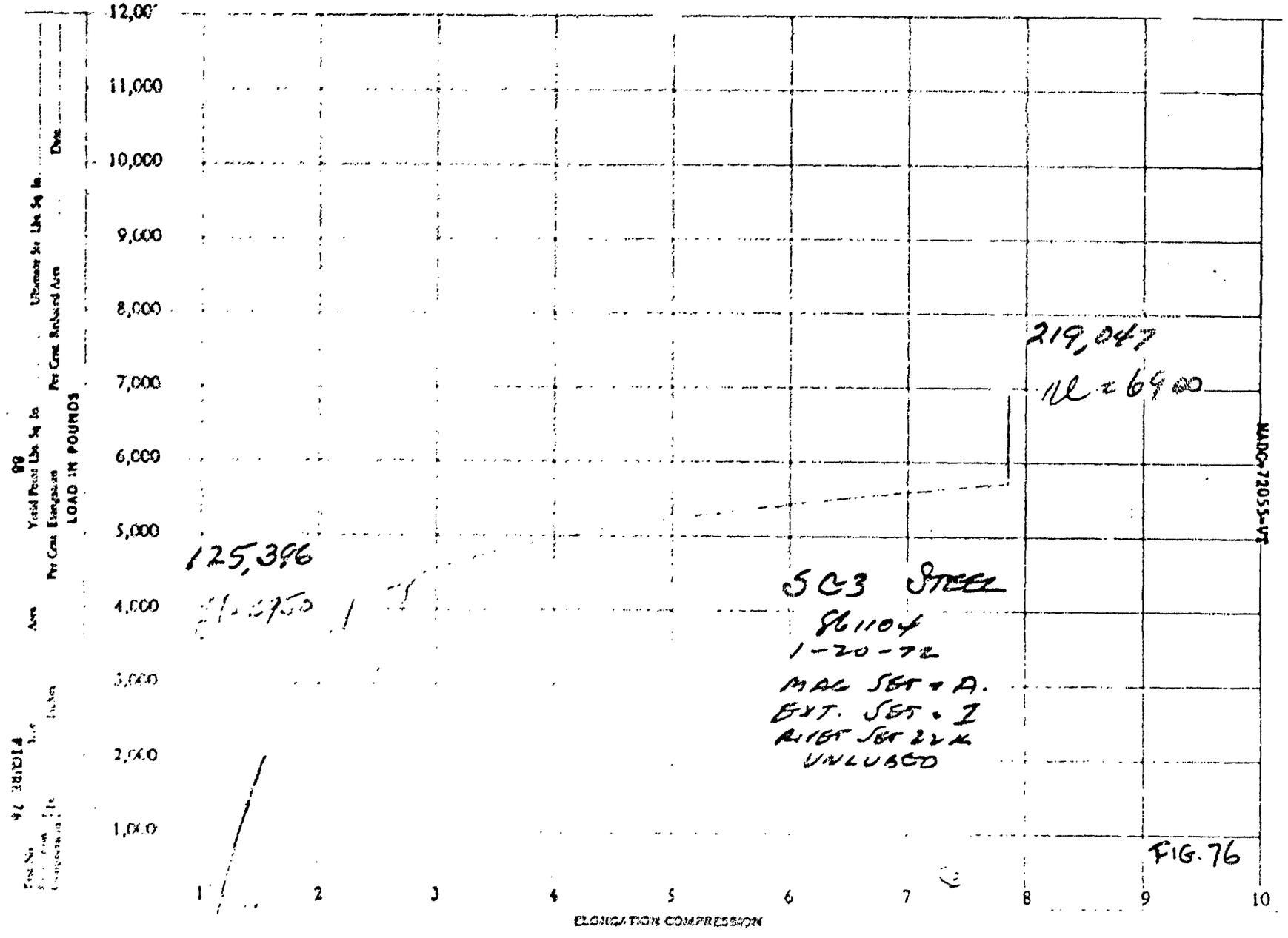

Test No
Elongation (In.
Compression (In.
Size
Area
Inches
Yield Point Lbs. Sq. In.
Per Cent. Elongation
Ultimate Str. Lbs. Sq. In.
Per Cent. Reduced Area
Date
LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
117,460
E=3700
U=9910
187,619
SBL-5 STEEL
851064
1-21-72
MAG SET=A
EXT SET=I
RIVET SET 22K
LUBED
FIG. 72
NADC-72055-VT

FIGURE 72


12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No.
Elongation in
Compression in
Spec.
Area
Yield Point Lbs. Sq. In.
Per Cent. Elongation
Ultimate Str. Lbs. Sq. In.
Per Cent. Reduced Area
Date
117,460
Y = 3700
U = 6790
215,555
SC6 STEEL
861104
1-20-72
AAG SET • A.
EXT SET • I
RIVET SET 22K
UNLUAGO
MADC-72055-VT
FIG. 73


12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
U = 6820
216,507
123,174
y = 3880
SL-4 Steel
86110-4
1-20-72
MAG. SET = A
EXT. SET = I
RIVET SET = 22K
UNLUBED
FIG. 74


12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
LOAD IN POUNDS
1
2
3
4
5
6
7
8
9
10
ELONGATION-COMPRESSION
Test No
Size
Area
Thin Plate Lbs. Sq. In.
Ultimate Str. Lbs. Sq. In.
Location
Per Cent Elongation
Per Cent Reduced Area
Dia
Compression
In
120,634
E = 3E07
E = 6800
219,047
4C-7 STEEL
86110Y
1-20-72
MAG SET = A
EXT SET = I
RIVET SET 22 KI
UNLOADED
FIG. 75


LOAD IN POUNDS
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION COMPRESSION
125,396
219,047
SC3 STEEL
86104
1-20-72
MAC SET = A.
EXT. SET = I
RIGT SET 2 K
UNLOADED
FIG. 76

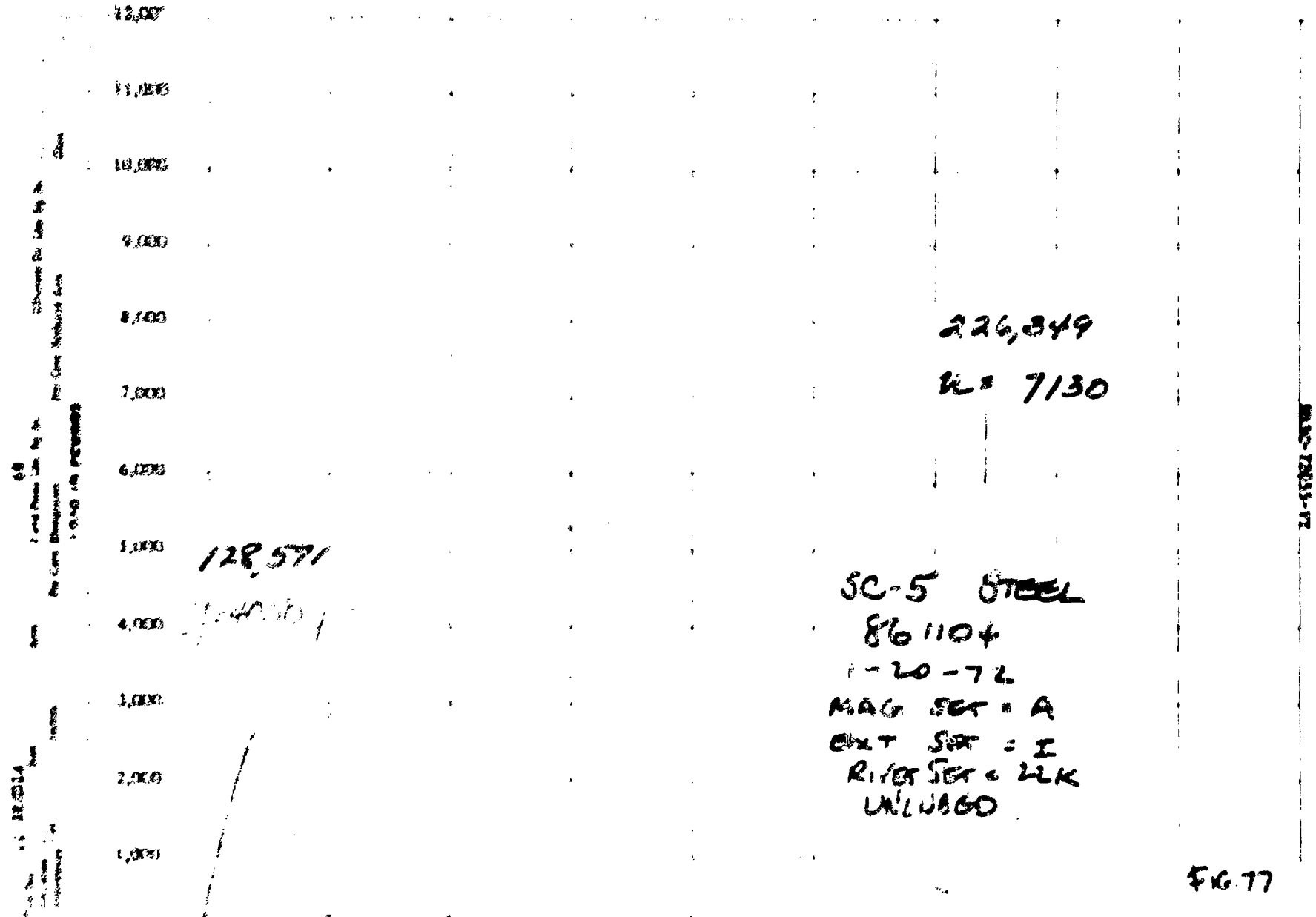
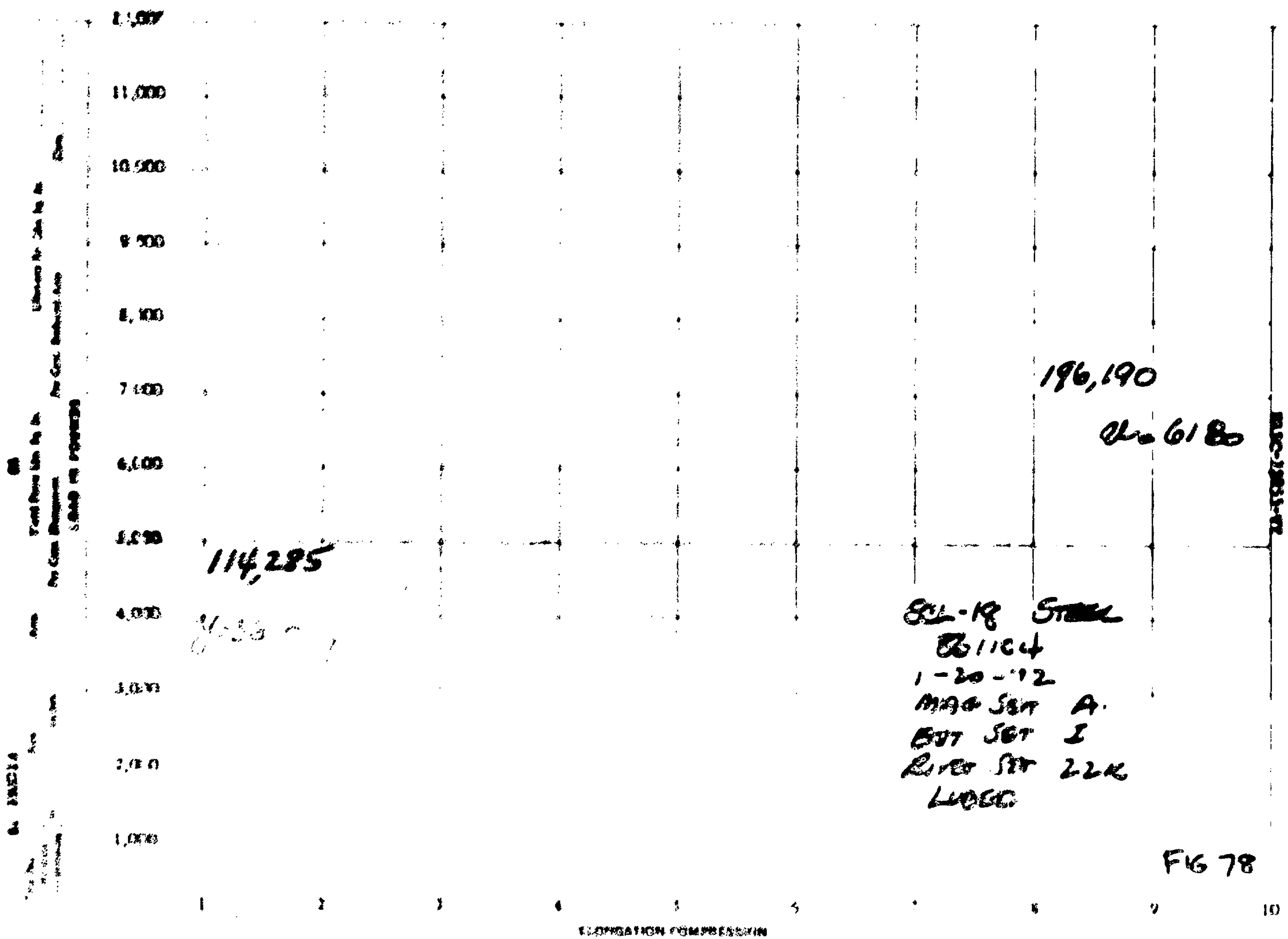

12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
128,571
226,349
K = 7130
SC-5 STEEL
86110+
1-20-72
MAG SET = A
EXT SET = I
RIVET SET = LLK
UNLIMITED

FIG 77



11,000
10,500
7,000
6,000
4,000
1,000
1
2
3
4
5
6
7
8
9
10
ELONGATION COMPRESSION
196,190
114,285
1-20-72
MAG SET A.
FIG 78

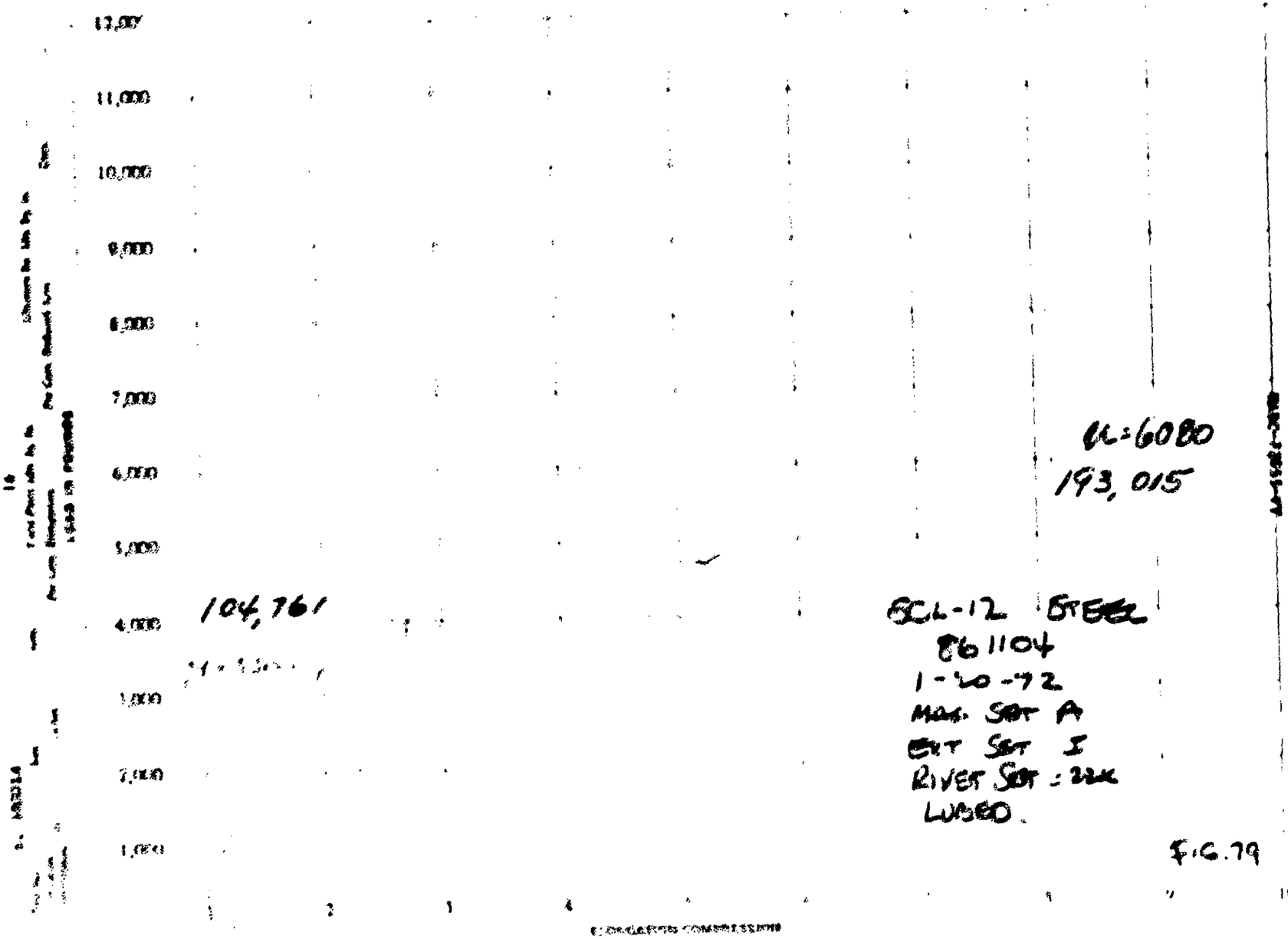
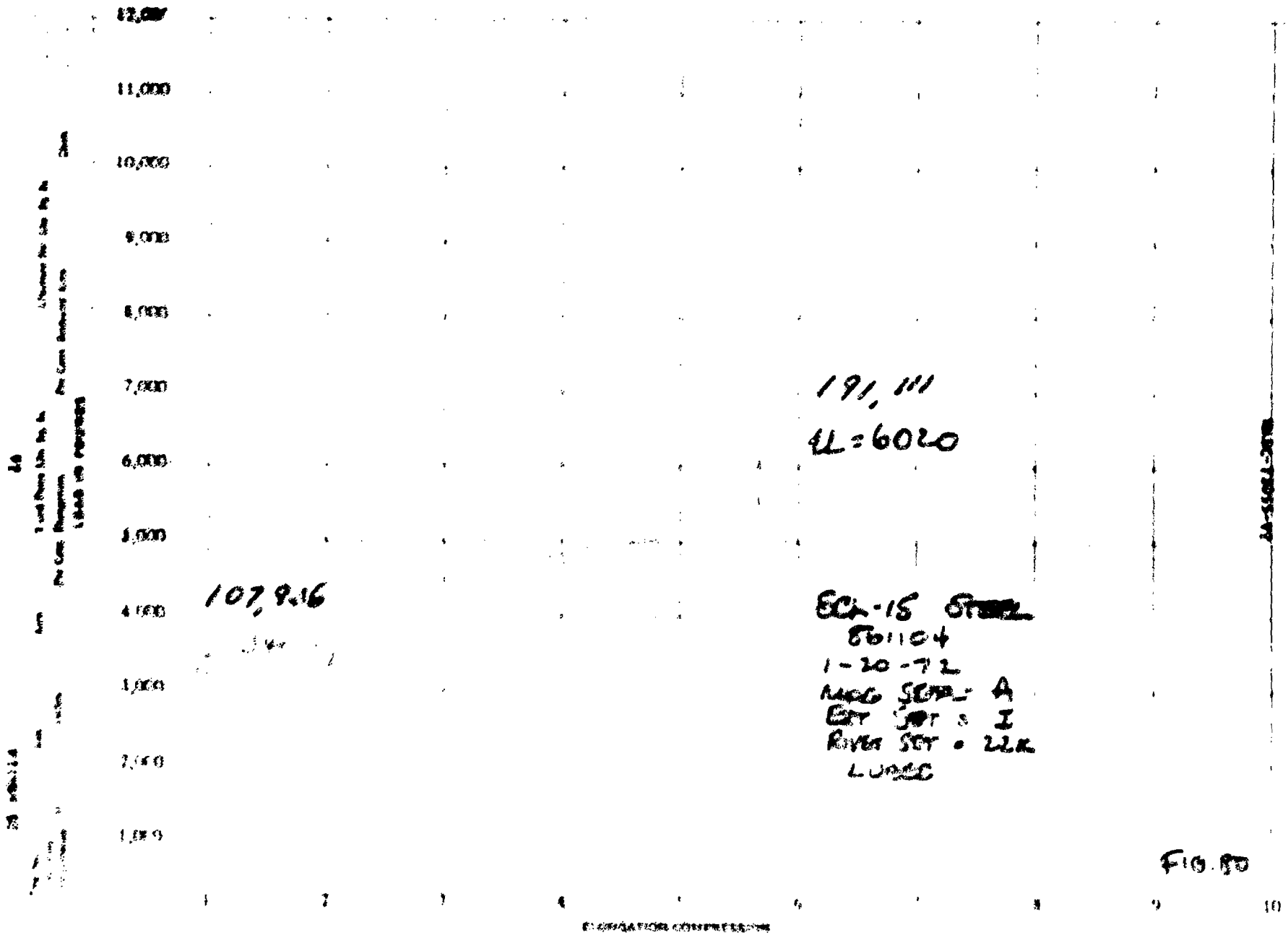

11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
104,761
UL=6080
193,015
FCL-12 STEEL
861104
1-20-72
MAG. SET A
EXT SET I
RIVET SET = 22K
LUBED.

FIG. 79


11,000
10,000
7,000
6,000
191,111
4L=6020
107,916
ECA-15 STEEL
60104
1-20-72
FIG. 10

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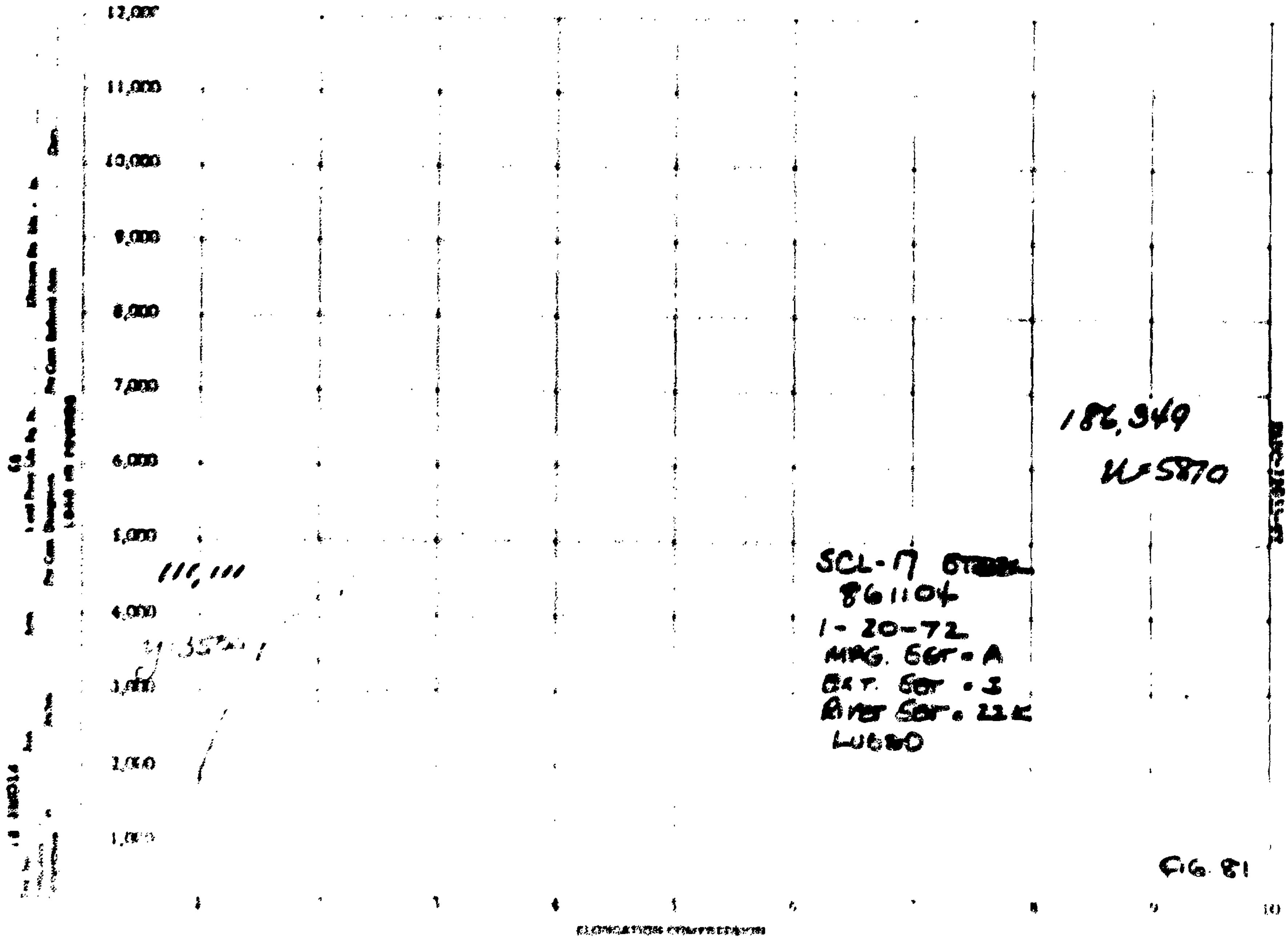

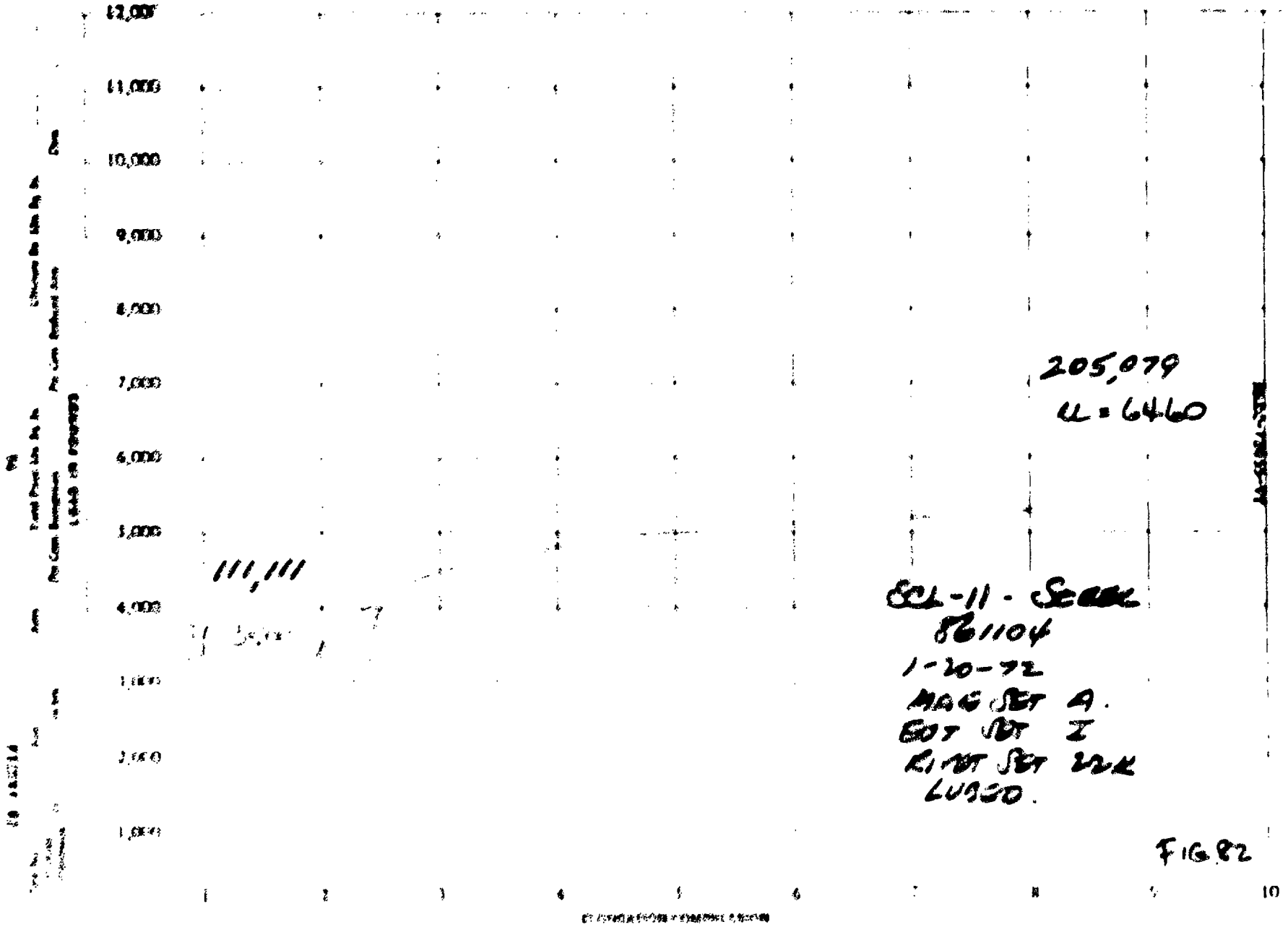
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
205,079
U = 6460
111,111
SCL-11 - Scale
86/104
1-20-72
MAG SET A.
EOT SET I
LIMIT SET 22K
LUDSO.
1
2
3
4
5
6
7
8
9
10

FIG 82